

**Final Report – Contract No. P7600020010
Inventory Terrestrial Mammals (Except Bats) at
San Antonio Missions National Historical Park**

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Introduction

Under the direction of the National Park Service Inventory and Monitoring program, the primary objective of this study was to inventory and document the presence of at least 90 percent of the terrestrial mammal species (hereafter mammals) at the San Antonio Missions National Historical Park (SAAN) properties in San Antonio, Bexar County, Texas and near Floresville, Wilson County, Texas. Bat species were not included in this study. Since no previous mammalian inventories had been conducted in these areas, this study also provided baseline inventory information for use by Park staff.

The objectives of this inventory were as follows:

- To review any previous inventories conducted at the sites and voucher specimens taken from the sites and held in vertebrate collections.
- To stratify by habitat type and conduct field inventories in each of these habitat types using standard techniques for mammals.
- To collect voucher specimens for each species inventoried if the species had not been previously collected at SAAN and placed in a collection. Voucher specimens shall be deposited in the Texas Cooperative Wildlife Collection at Texas A&M University.
- To prepare a final report to the National Park Service with updated species lists and identification and descriptions of species of concern, rare, threatened, or endangered.

Methods

This study was conducted from April 2002 to June 2003. The San Antonio Missions National Historical Park (SAAN) consists of two main units, the Missions San Jose, San Juan, Espada, and Concepcion (hereafter the Missions), and the Rancho de las Cabras (hereafter Rancho). Across these units we delineated the habitats into riparian woodlands, huisache woodlands, grasslands, and oldfields. At the Rancho and the Missions, mammals were sampled on two consecutive nights each month from April 2002 through June 2002, and October 2002 through June 2003. From January 2003 through June 2003, mammals were sampled on four consecutive nights each month. We

decided that sampling four consecutive nights would be a more effective approach in the second half of the study to increase the chances of capturing rare species. Mammals were sampled using a combination of four techniques: trapping, track-plates and Trailmaster cameras, observation of signs (tracks, scats, and other), and direct visual observations.

Trapping techniques included transects of 10 stations spaced 10-m apart with 2 Sherman traps per station, interspersed with 5 Tomahawk traps, and 5 track-plates. The locations of these transects are indicated in Figures 1-4. Sherman traps were baited with oats, while Tomahawk traps were baited with canned cat food or strawberry jelly. Traps were set in the afternoon and checked the following morning at sunrise. Smaller trapped mammals, primarily rodents, were ear tagged for recapture identification. Larger mammals were recorded and released. Standard demographic data was recorded for each captured animal along with general habitat information (see Table 1- Habitat Information Sheet), GPS coordinates, and a digital picture.

Six pitfall arrays (three in Missions, three in Rancho) were constructed in different habitat areas to catch shrews and gophers (see Figs. 5 and 6). Pitfalls consisted of two drift fences perpendicular to each other with a bucket buried so its lip was level with the ground at each end. In the center, there was either another bucket or a funnel trap to catch reptiles and amphibians for another study.

Larger mammals, primarily carnivores, were also sampled using track-plate stations placed along trapping transects and two Trailmaster trail monitor and camera systems. Each track-plate consisted of a sheet of aluminum flashing approximately 50x80cm placed flat on the ground. The flashing was painted with a mixture of 700mL 100% ethyl alcohol and 300mL water with 12 teaspoons of red carpenter's chalk. Each station was baited with cat food placed in a small jar in the center of the plate. A Trailmaster trail monitor and camera system was setup in different habitats to photo document larger mammals along trails. The trail monitor system consisted of an infrared beam that when tripped by passing mammals activated the camera system to take a photograph.

Lastly, all visual observations of mammals during this study and visuals by National Park Service staff were also recorded.

The location of all terrestrial mammal observations was recorded using Trimble GeoExplorer II (Trimble Navigation) receivers owned by the Department of Biology, Trinity University. Using software provided by Trimble, locations were differentially corrected to an accuracy of approximately 2-5 meters. Data were collected and stored as UTM coordinates using NAD 1983 datum.

For species not previously collected within the park, we prepared two voucher specimens (one male and one female) for the majority of the smaller mammals and one specimen of either sex for medium mammals. Tissue samples and the skull were also retained. For larger species, scat was used as a voucher.

All observations were combined at the end of the study and sorted by habitat within the Missions and the Rancho. Relative or proportional abundance of each species was plotted for each habitat type. For each habitat the number of species was recorded along with Simpson's (D) and Shannon's (H) diversity measures (Magurran 2004). Since these measures are sensitive to the number of species recorded, evenness measures were also calculated for each diversity measure (Simpson's evenness – E; Shannon's evenness – J).

Results

A search of databases from universities that manage natural museums and wildlife collections revealed no evidence of any comprehensive studies occurring in the SAAN. Institutions such as Texas Tech, Angelo State, Texas A&M, and the University of New Mexico - Albuquerque possess several specimens in their wildlife collections that were found in areas near SAAN, none of which were found within the Park itself. Areas with sample specimens in the investigated wildlife collections were limited to Poth, Floresville, and Kosciusko in Wilson County.

A literature review also revealed a lack of studies conducted in SAAN. The Dissertation Abstract database was used to track any dissertations or master thesis that may have involved mammal studies in SAAN. The search revealed 41 documents under the topic "Texas Mammals." None of the dissertation abstracts found under "Texas Mammals" involved any surveys of mammals in SAAN. School websites such as Texas A&M, Texas Tech University, and Angelo State were searched for any possible information that may suggest the existence of dissertation topics involving mammals of SAAN. No such evidence was found. Other databases were searched, such as Digital Dissertation, but there were not any significant findings that pertained to SAAN.

In terms of the primary literature, no papers have been published involving mammals within SAAN. With the exception of Allen (1896), few mammal studies have been focused in Bexar and Wilson Counties. The literature and museum collection search indicated that a field study on the mammals of SAAN was needed.

Including domestic dogs and cats, a total of 27 species from 8 Orders were observed at the San Antonio Missions National Historical Park during this study (Table 2). Eighteen of these species were successfully vouchered. The locations of most mammal observations by species are presented in Figures 7 - 29. We did not collect geographic information on dog sightings, so there is no figure for *Canis familiaris*. The sightings for *Myocaster coypus* (Nutria) were also based on visuals by Park Staff and did not contain specific geographic information.

There was variation in the abundance of species trapped between the Missions and the Ranchos (Tables 3-6). The most abundant small mammal species trapped at the Missions was *Sigmodon hispidus* (Cotton rat), while *Peromyscus maniculatus* (Deer mouse) was the most abundant small mammal at the Ranchos (Table 3). For medium sized mammals, *Didelphis virginiana* (Virginia opossum) was the most common species

at both the Ranchos and Missions, followed closely by *Procyon lotor* (Raccoon; Table 4). Trap success for these species was higher at the Missions compared to the Ranchos. We also trapped *Mephitis mephitis* only at Ranchos.

The track-plates and wildlife cameras revealed the presence of additional species in differing abundances than the trapping data (Table 5 and 6). Additional species documented included *Felis catus* (domestic cat), *Urocyon cinereoargenteus* (Gray fox), *Dasypus novemcinctus* (9-banded armadillo), and *Lynx rufus* (Bobcat).

All observations (trap captures, track-plates, cameras, visual observations) were pooled and sorted by habitat (Table 7). Across all habitats, there were more species (higher species richness) and a higher diversity for the habitats of the Rancho compared to the Missions. Within both locations, the Huisache woodlands had the highest species richness of any habitat. The Oldfield habitat of the Missions and the Grasslands of the Rancho had the lowest species richness. Within the Missions, Huisache woodlands had the highest Simpson's and Shannon's diversity.

Across all the Missions habitats, *P. lotor* was the most abundant mammal (Fig. 30). Within specific habitats, *S. hispidus* was the most abundant mammal found in the Oldfields, followed by *P. lotor* in Riparian woodlands. Across all the Rancho habitats, *P. maniculatus* was the most abundant mammal (Fig. 31). Within the Riparian Woodlands of the Rancho, *P. lotor* was the most common species, while *P. maniculatus* was the most common species in the Huisache woodlands. In the grasslands of the Rancho, *M. mephitis* and *S. hispidus* were the most abundant observations.

Discussion

None of the 27 species observed or collected during this study were unexpected based on data in Davis and Schmidly (1994). Furthermore, none of the species observed are considered rare, threatened, or endangered by state or federal authorities. The Rancho location had more species that were more diverse than the Missions habitats (Table 7). This was perhaps not too surprising given the urban location of the Missions habitats which results in these habitats being more fragmented and isolated. Furthermore, more exotic species were observed in the Missions than Rancho. Exotic species (see Table 2) have become the number 2 reason for loss of native biodiversity in the United States, and control of these exotic species at SAAN would be an important management priority to conserve biodiversity.

While there were no unexpected species observed, there are likely more species to be found with continued monitoring. At the Rancho, we observed squirrel footprints on a tracking plate that were either *Spermophilus mexicanus* (Mexican ground squirrel), *S. tridecemlineatus* (13-lined Ground Squirrel), or *S. variegatus* (Rock squirrel). Future survey work could distinguish these species. It is also likely that *Bassariscus astutus*, Ring-tailed cats, could be found at the Rancho location with more intensive sampling.

The relative abundance of species (Figs. 30 and 31) suggest some candidates for environmental monitoring. For non-grassland habitats of the Rancho, *P. maniculatus* is a good candidate because they are easily trapped and are known to be sensitive to environmental fluctuations (see Kaufman and Kaufmann 1989 for general review). For the grasslands of the Rancho, *S. hispidus*, *Chaetodipus hispidus* (Hispid Pocket Mouse), and *Reithrodontomys fulvescens* (Fulvous Harvest Mouse) are good indicator species. For the Missions habitats, *S. hispidus*, *P. maniculatus*, and *Baiomys taylori* (Northern pigmy mice) are potentially good indicator species that would be sensitive to environmental fluctuations.

Other products of this study include the following:

- This final report in MS word and PDF format.
- Excel and Access spreadsheets with GPS locations of voucher specimens, sampling sites, and all observations.
- Labeled digital photos of all observations in PowerPoint format.
- ArcGIS data of all observations (NAD 1983 Datum).
- Updated NPSpecies database file for voucher specimens.
- ANCS+ data of voucher specimens.
- Original copies of field notes and catalog.
- Voucher specimens to be deposited in the Texas Cooperative Wildlife Collection, Texas A&M University.

Literature Cited

- Allen, J.A. 1896. On mammals collected in Bexar County and vicinity, Texas, by Mr. H. P. Atwater with field notes by the collector. Bulletin of the American Museum of Natural History, Vol VIII, pp 47-80.
- Davis, W.B., and D.J. Schmidly. 1994. The Mammals of Texas. Texas Parks and Wildlife Press, Austin, TX.
- Kaufman, D. W., and G. A. Kaufman. 1989. Population biology, in G. L. Kirkland, Jr. and J. N. Layne (eds.), Advances in the Study of *Peromyscus* (Rodentia), pages 233-270. Texas Tech University Press, Lubbock, Texas.
- Magurran, A.E. 2004. Measuring Biological Diversity. Blackwell Science Ltd, Malden, MA. 256 pp.

Table 1. Field data sheet used to document habitat information for mammal observations.

Date: _____ Park Code: _____ Plot ID #: _____

Surveyors: _____

UTM Zone: _____ Datum: _____ Project File: _____

Northing: _____ Easting: _____ Waypoint #: _____

Location Description:

TOPO Quad (s): _____

T: _____ R: _____ S: _____ Plot size: length (m): _____ width (m): _____ radius (m): _____

Photo Roll ID: _____ Photo #: _____

Site Characteristics:

Elevation (ft): _____ Slope : _____ Aspect: _____

Topographic Position:

(1) Level Toe Slope	(2) Lower Slope	(3) Mid-Slope	(4) Upper-Slope
(5) Escarpment/ Face	(6) Ledge	(7) Crest	(8) Depression Draw

Slope-shape, Horizontal (30m): (1) concave (2) Straight (3) Convex

Vertical(30m): (1) concave (2) Straight (3) Convex

Surface Water: (1) In Plot (2) <50m (3) >50m

Hydrologic Regime: (1) Permanently Flooded (2) Semi-Permanently Flooded
(3) Seasonally/Temporarily Flooded (4) Intermittently Flooded (5) Seep (6) Upland

Ground Cover: Bryophyte/Lichen _____ Woody Debris _____ Grass Litter _____

Tree Leaf Litter _____ Bedrock/Boulder _____ Gravel/Cobble _____

Sand / Soil _____

Cover Classes: (1) 0-1, (2) 1-5, (3) 5-10, (4) 10-25, (5) 25-50, (6) 50-75, (7) 75-95, (8) 95-100

Vegetation Description:

Leaf Phenology (of uppermost stratum having >10% cover):

Trees and Shrubs

☐ Evergreen

☐ Deciduous

☐ Mixed (Evergreen and Deciduous)

Herbs

☐ Annuals

☐ Perennials

☐ Mixed (Annuals and Perennials)

Physiognomic Class:

☐ Forest

☐ Woodland

☐ Sparse Woodland

☐ Shrubland

☐ Sparse Shrubland

☐ Herbaceous

☐ Sparse Vegetation

Strata	Stratum Height	Stratum Cover Class	Dominant Species
Canopy	<input type="text"/>	<input type="text"/>	<input type="text"/>
Sub-Canopy	<input type="text"/>	<input type="text"/>	<input type="text"/>
Shrub	<input type="text"/>	<input type="text"/>	<input type="text"/>
Herbaceous	<input type="text"/>	<input type="text"/>	<input type="text"/>

Stratum Height Classes: (1) <0.5m (2) 0.5-5m (3) 5-10m (4) 10-20m (5) 20-30m (6) >30m

Stratum Cover Classes: (1) <10% (2) 10-25% (3) 25-60% (4) >60%

Table 2. List of terrestrial mammals documented at the San Antonio Missions National Historical Park, Texas and summary of inventory methods used to identify species presence. Observations of mammals during this study include those by the National Park Service staff. * Species vouchered.

Order	Family	Genus species	Common Name	Exotic?	Inventory Methods			
					Trap	Sign	Track-plates or Camera	Observe
Didelphimorphia	Didelphidae	<i>Didelphis virginiana</i>	Virginia Opossum*		X		X	X
Insectivora	Soricidae	<i>Cryptotis parva</i>	Least Shrew*		X			
Xenarthra	Dasypodidae	<i>Dasypus novemcinctus</i>	Nine-banded Armadillo				X	X
Lagomorpha	Leporidae	<i>Sylvilagus floridanus</i>	Eastern cottontail*		X			X
		<i>Lepus californicus</i>	Black-tailed Jackrabbit					X
Rodentia	Sciuridae	<i>Sciurus niger</i>	Fox Squirrel					X
		<i>Spermophilus spp.</i>	Ground Squirrel				X	
	Geomysidae	<i>Geomys attwateri</i>	Pocket Gopher*		X	X		
	Heteromyidae	<i>Chaetodipus hispidus</i>	Hispid Pocket Mouse *		X			
	Muridae	<i>Reithrodontomys fulvescens</i>	Fulvous Harvest Mouse *		X			
		<i>Peromyscus leucopus</i>	White-footed Mouse *		X			
		<i>Peromyscus maniculatus</i>	Deer Mouse *		X			
		<i>Baiomys taylori</i>	Pygmy Mouse *		X			
		<i>Sigmodon hispidus</i>	Hispid Cotton Rat *		X			
Rodentia	Muridae	<i>Rattus rattus</i>	Roof Rat	YES	X			
		<i>Mus musculus</i>	House Mouse *	YES	X			
	Myocastoridae	<i>Myocaster coypus</i>	Nutria	YES				X
Carnivora	Canidae	<i>Canis latrans</i>	Coyote *			X	X	
		<i>Urocyon cinereoargenteus</i>	Gray Fox *				X	X (Dead on Road)
		<i>Procyon lotor</i>	Raccoon		X		X	X
		<i>Mephitis mephitis</i>	Striped skunk*		X		X	X
		<i>Canis familiaris</i>	Dog	YES		X	X	X
	Felidae	<i>Lynx rufus</i>	Bobcat *			X	X	
		<i>Felis catus</i>	House cat	YES		X	X	X
Artiodactyla	Cervidae	<i>Odocoileus virginianus</i>	White-tailed Deer *					X
	Suidae	<i>Sus scrofa</i>	Feral Pig*	YES				X
	Dicotylidae	<i>Tayassu tajacu</i>	Collared Peccary*					X

Table 3. Mammal capture results using Sherman traps at the San Antonio Missions National Historical Park, including the Rancho de las Cabras. Trap success was calculated by dividing number of individuals caught by trap nights.

Species	Location	Total Trap Nights	Number Caught	Number of Individuals	Sex ratio (M:F)	Trap Success
<i>B. taylori</i>	Missions	1400	5	5	3:2	0.36%
<i>C. parva</i>	Missions	1400	1	1	1:0	0.07%
<i>M. musculus</i>	Missions	1400	1	1	1:0	0.07%
<i>P. leucopus</i>	Missions	1400	2	2	2:0	0.14%
<i>P. maniculatus</i>	Missions	1400	10	8	3:5	0.71%
<i>S. hispidus</i>	Missions	1400	31	28	13:14 (1 escaped)	2.21%
<i>P. leucopus</i>	Rancho	3700	3	2	1:1	0.08%
<i>P. maniculatus</i>	Rancho	3700	19	17	13:3	0.51%
<i>R. fulvescens</i>	Rancho	3700	1	1	0:1	0.03%
<i>S. hispidus</i>	Rancho	3700	3	3	3:0	0.08%
<i>C. hispidus</i>	Rancho	3700	2	2	0:2	0.05%
<i>C. parva</i>	Rancho	3700	3	3	0:3	0.08%

Table 4. Mammal capture results using National, Tomahawk, and large traps at the San Antonio Missions National Historical Park, including the Rancho de las Cabras. Trap success was calculated by dividing number of individuals caught by trap nights.

Species	Location	Trap Nights	Number Caught	Number of Individuals	Sex ratio (M:F)	Trap Success
<i>D. virginiana</i>	Missions	222	14	14	7:7	6.31%
<i>P. lotor</i>	Missions	222	13	11	5:4 (2 unknowns)	5.86%
<i>D. virginiana</i>	Rancho	206	7	6	3:3	3.40%
<i>M. mephitis</i>	Rancho	206	2	2	Unknown	0.97%
<i>P. lotor</i>	Rancho	206	3	3	2:1	1.46%

Table 5. Mammal capture results using Track-Plates at the San Antonio Missions National Historical Park, including the Rancho de las Cabras. Trap success was calculated by dividing number of individuals caught by trap nights.

Species	Location	Track-Plate Nights	Number Caught	Track-Plate success
<i>D. virginiana</i>	Missions	224	10	4.46%
<i>F. catus</i>	Missions	224	4	1.79%
<i>M. mephitis</i>	Missions	224	2	0.89%
<i>P. lotor</i>	Missions	224	10	4.46%
<i>U. cinereoargenteus</i>	Missions	224	1	0.45%
<i>C. latrans</i>	Rancho	189	3	1.59%
<i>D. novemcinctus</i>	Rancho	189	1	0.53%
<i>D. virginiana</i>	Rancho	189	5	2.65%
<i>M. mephitis</i>	Rancho	189	2	1.06%
<i>P. lotor</i>	Rancho	189	41	21.69%
<i>Spermophilus spp.</i>	Rancho	189	1	0.53%

Table 6. Mammal capture results using Cameras at the San Antonio Missions National Historical Park, including the Rancho de las Cabras. Trap success was calculated by dividing number of individuals caught by trap nights.

Species	Location	Number of Camera Nights	Number Captured	Camera Success
<i>D. novemcinctus</i>	Missions	34	2	5.88%
<i>D. virginiana</i>	Missions	34	5	14.71%
<i>M. mephitis</i>	Missions	34	2	5.88%
<i>P. lotor</i>	Missions	34	12	35.29%
<i>U. cinereoargenteus</i>	Missions	34	4	11.76%
<i>D. novemcinctus</i>	Rancho	28	1	3.57%
<i>D. virginiana</i>	Rancho	28	1	3.57%
<i>L. rufus</i>	Rancho	28	1	3.57%
<i>M. mephitis</i>	Rancho	28	2	7.14%
<i>P. lotor</i>	Rancho	28	3	10.71%
<i>D. novemcinctus</i>	Rancho	28	1	3.57%
<i>D. virginiana</i>	Rancho	28	1	3.57%
<i>L. rufus</i>	Rancho	28	1	3.57%
<i>M. mephitis</i>	Rancho	28	2	7.14%
<i>P. lotor</i>	Rancho	28	3	10.71%

Table 7. Summary of community statistics for terrestrial mammals in different habitats at the San Antonio Missions National Historical Park. These data include all geographically defined observations, and were divided into two units, the Missions located in San Antonio and the Rancho, for the Rancho de las Cabras unit located near Floresville, Texas. The community statistics are explained in the Methods. Evenness measures are provided in parentheses following Diversity indices. There were no Oldfields sampled at the Rancho and no Grasslands sampled at the Missions.

Habitat		Missions	Rancho
	Species Richness	5	
Oldfield	Simpson's D (E)	1.72 (0.35)	
	Shannon's H (J)	0.89 (0.56)	
	Species Richness		4
Grassland	Simpson's D (E)		3.20 (0.80)
	Shannon's H (J)		1.26(0.90)
	Species Richness	8	8
Riparian Woodlands	Simpson's D (E)	2.40 (0.30)	4.63 (0.58)
	Shannon's H (J)	1.29 (0.62)	1.73 (0.83)
	Species Richness	12	15
Huisache Woodlands	Simpson's D (E)	4.71 (0.40)	7.39 (0.49)
	Shannon's H (J)	1.86 (0.75)	2.29 (0.85)
	Species Richness	14	18
All	Simpson's D (E)	4.13 (0.29)	7.54 (0.42)
	Shannon's H (J)	1.79 (0.68)	2.36 (0.82)

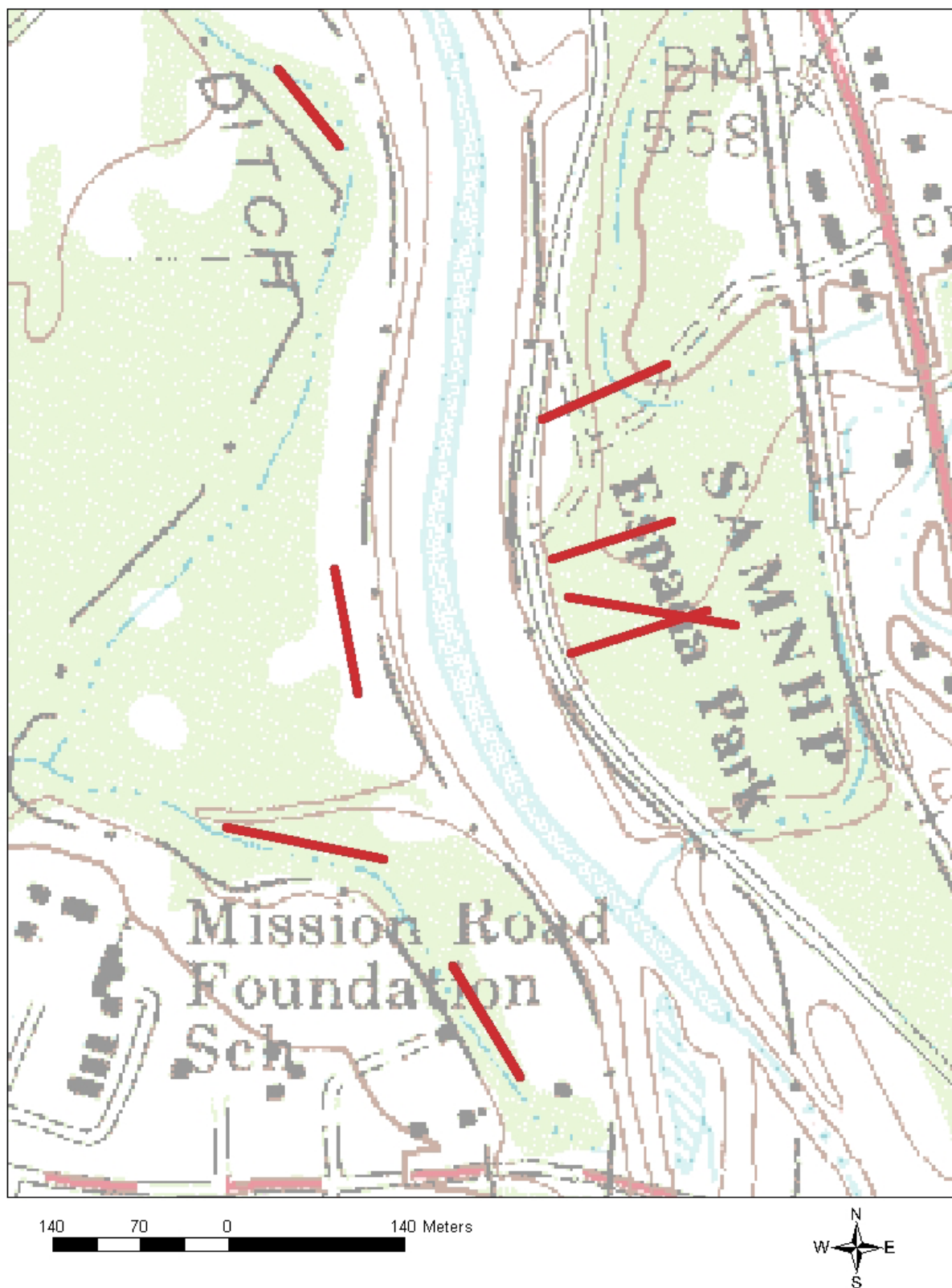


Figure 1. Location of trapping transects set in the various habitats identified throughout the northernmost area of the San Antonio Missions National Historical Park.

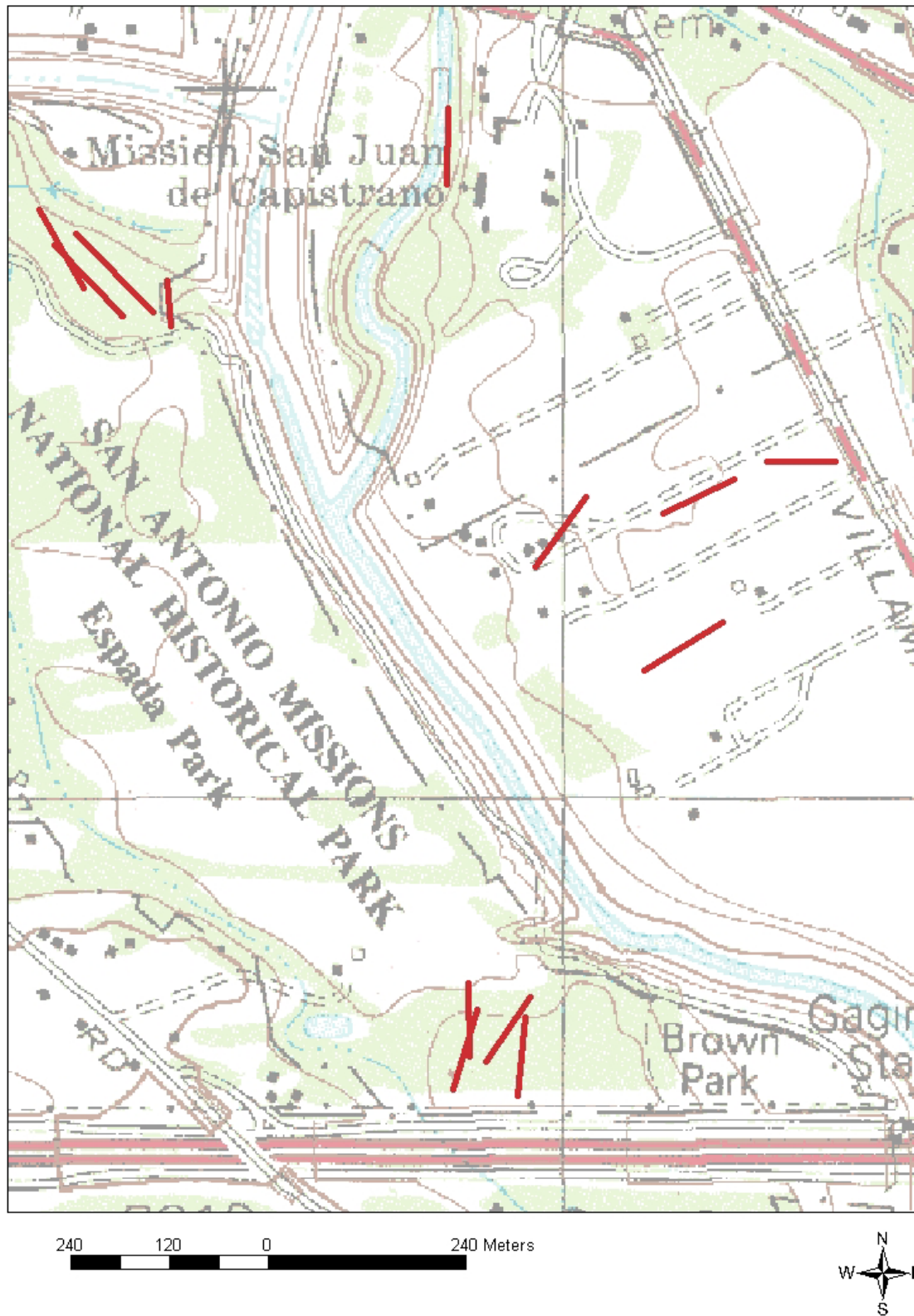


Figure 2. Location of trapping transects set in the various habitats identified throughout the southernmost area of the San Antonio Missions National Historical Park.

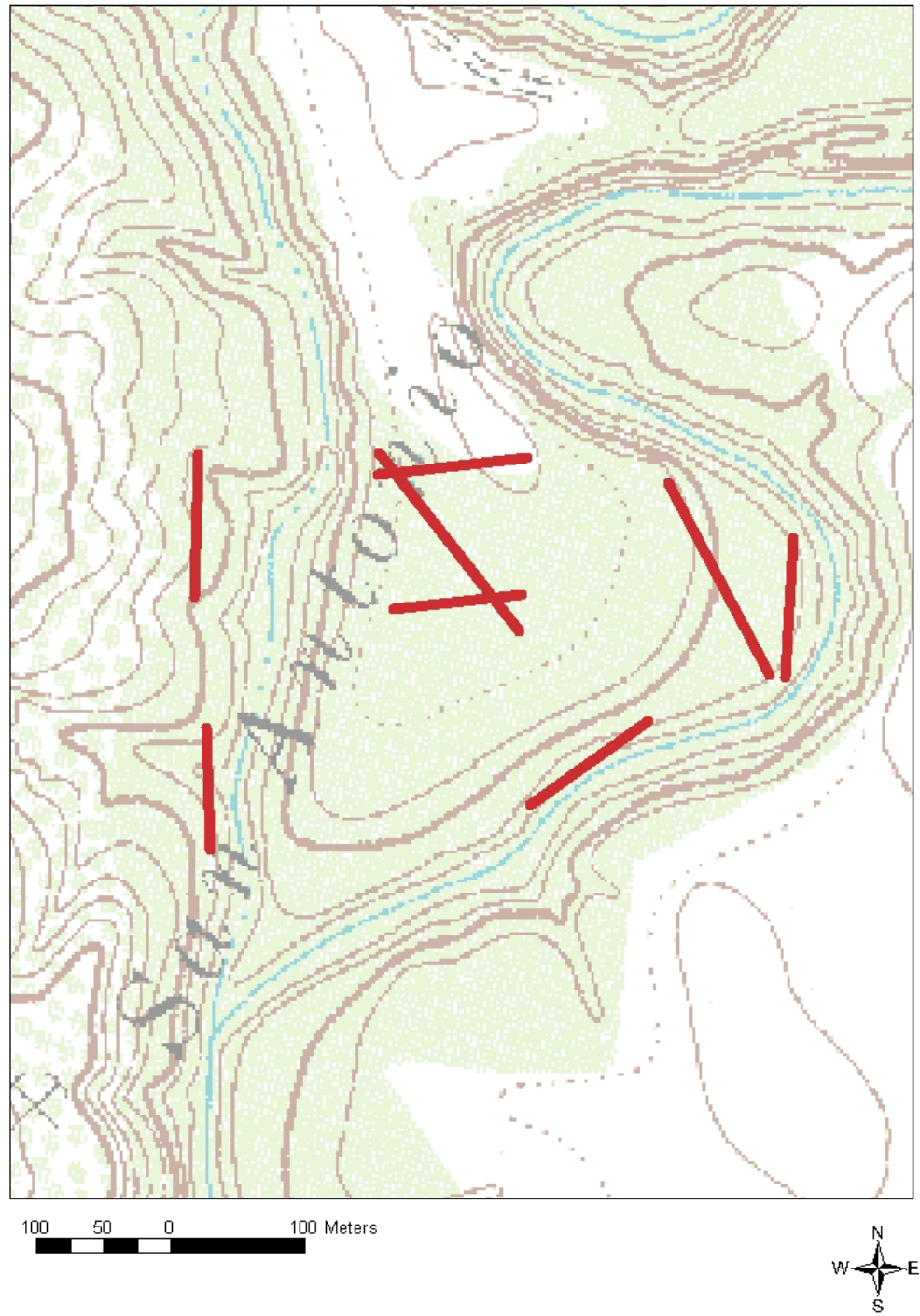


Figure 3. Location of trapping transects set in the various habitats identified throughout the easternmost area of the Rancho Del las Cabras National Historical Park.

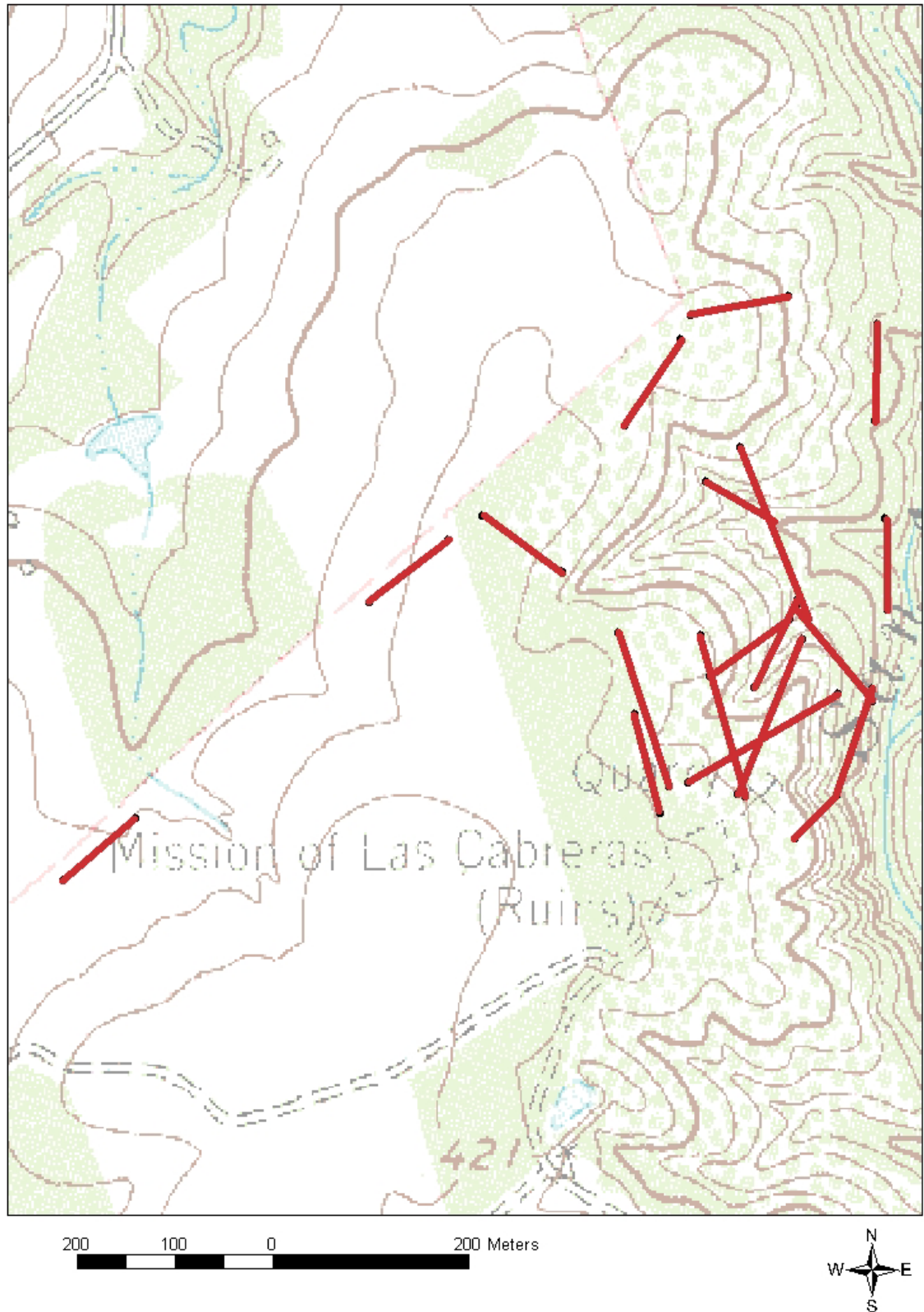


Figure 4. Location of trapping transects set in the various habitats identified throughout the westernmost area of the Rancho Del las Cabras National Historical Park.

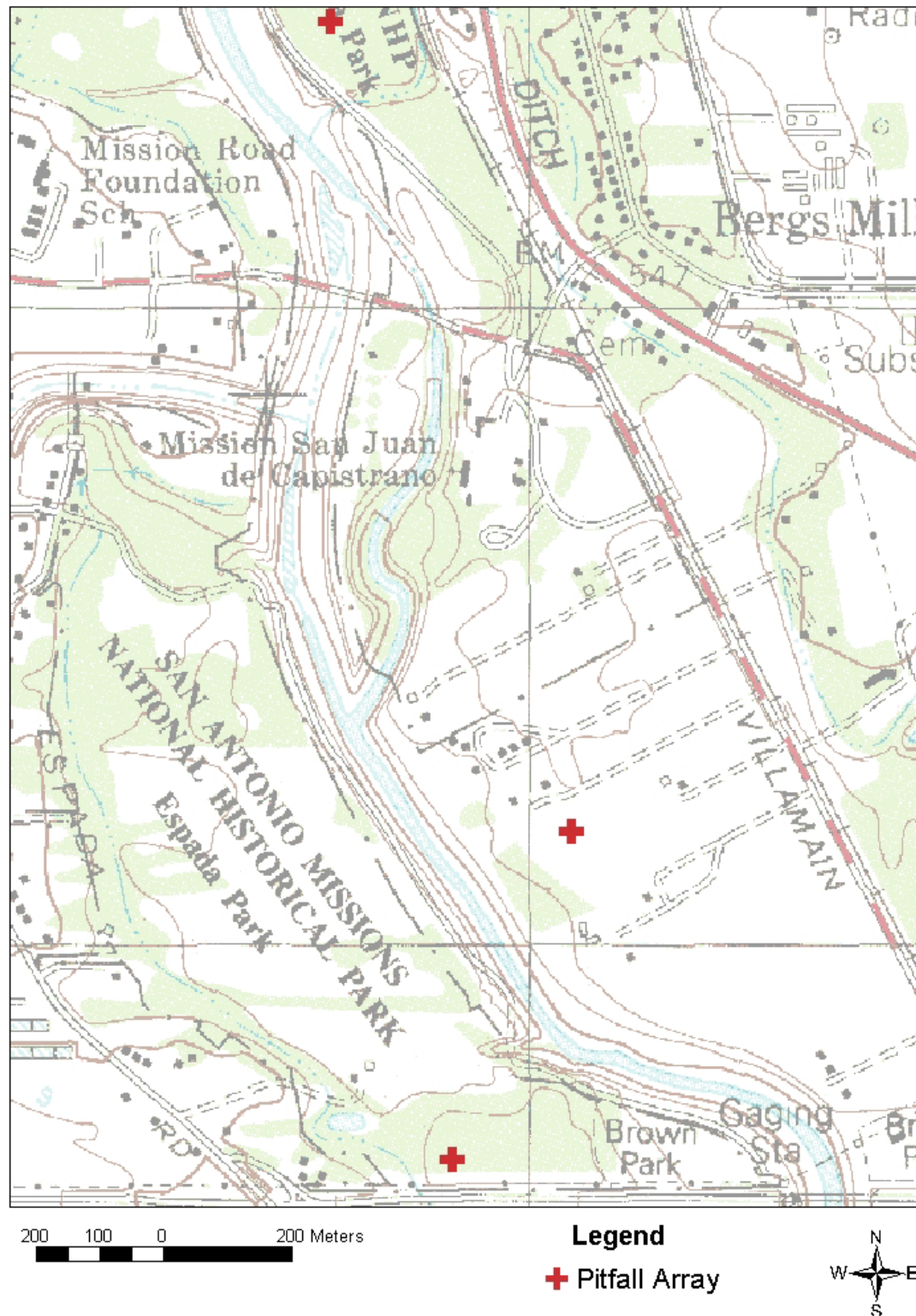


Figure 5. Location of pitfall arrays in the San Antonio Missions National Historical Park.

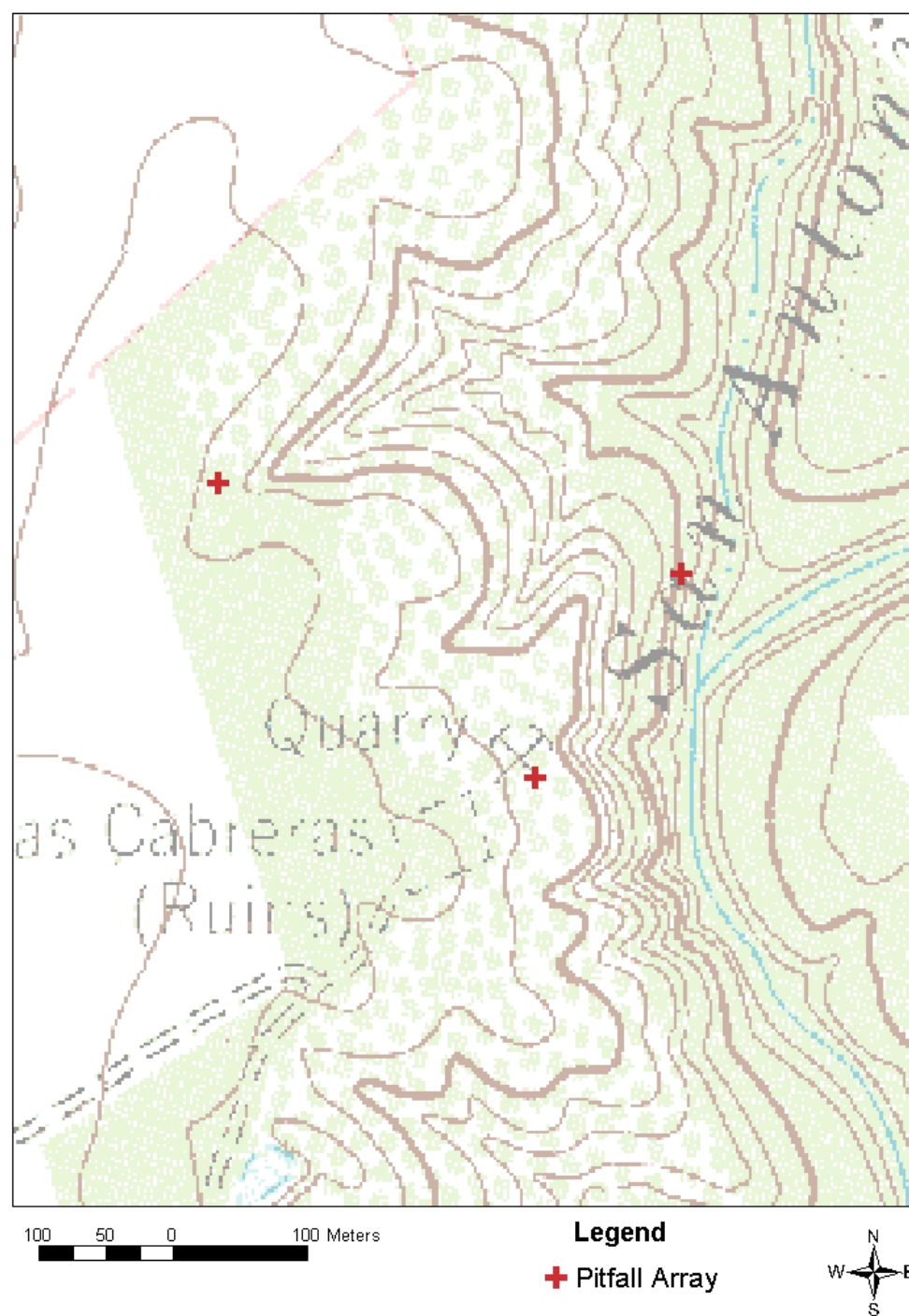


Figure 6. Location of pitfall arrays in the Rancho de las Cabras National Historical Park.

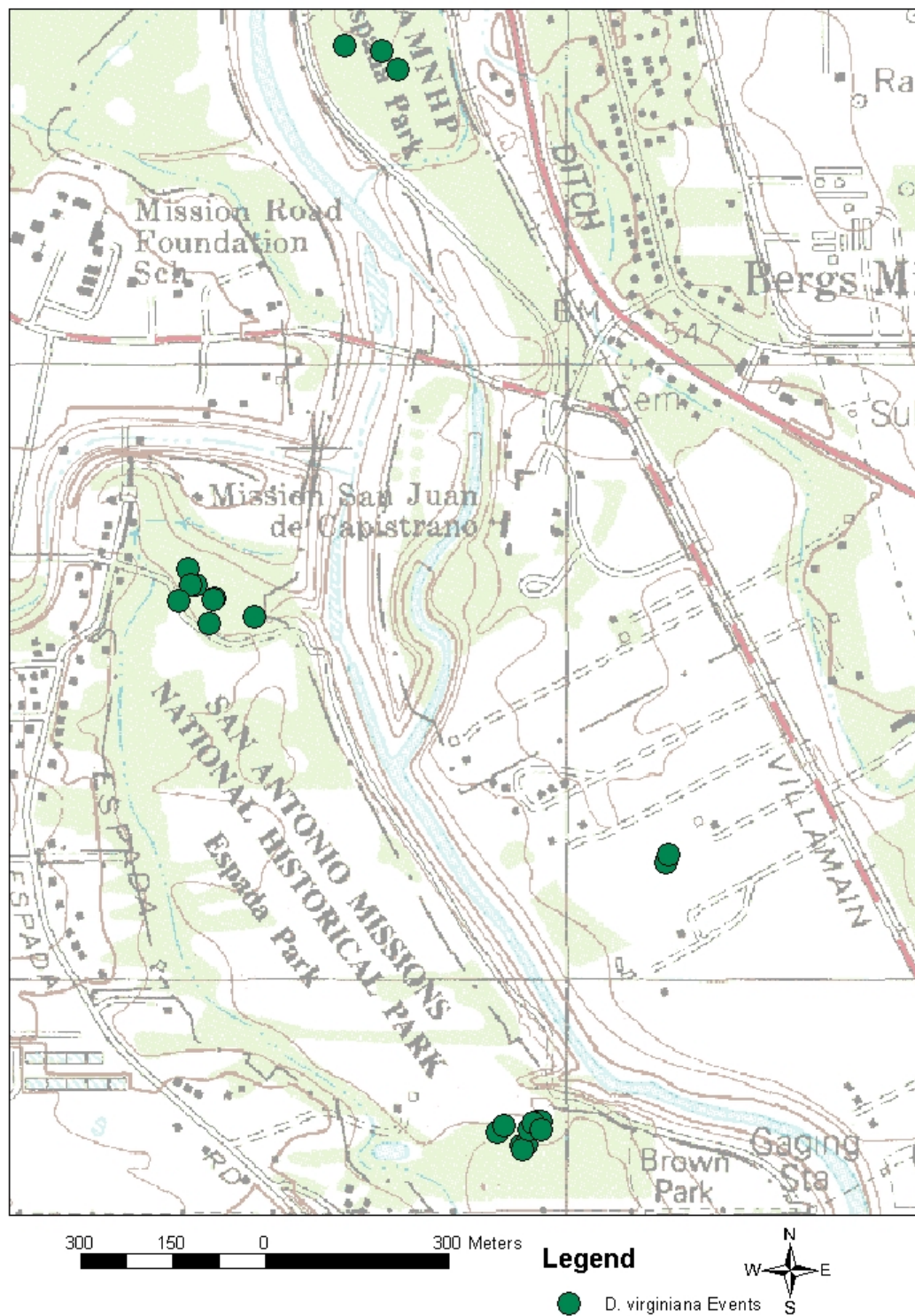


Figure 7. Location of *D. virginiana* (Virginia Opossum) observations at the San Antonio Missions National Historical Park.

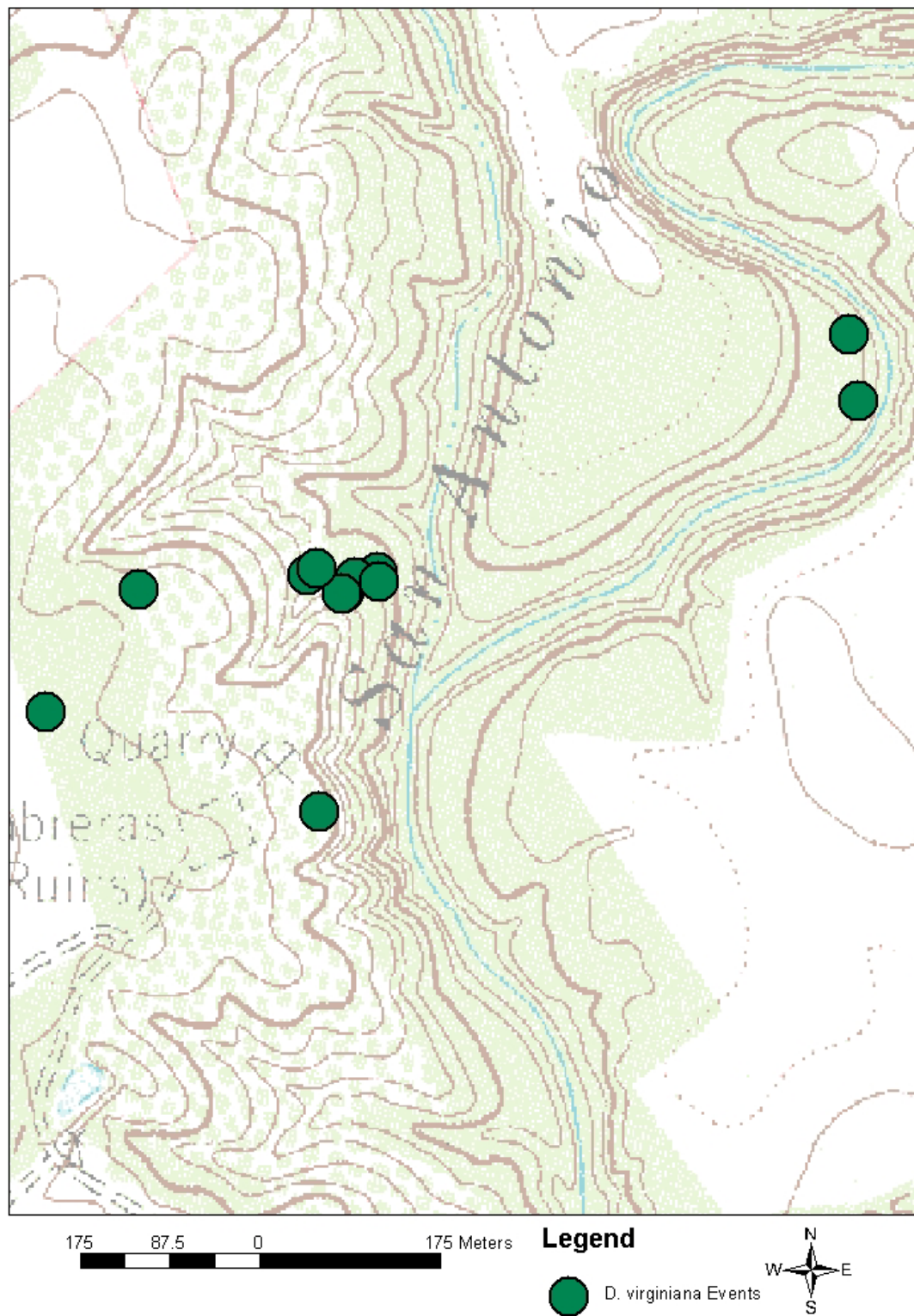


Figure 8. Location of *D. virginiana* (Virginia Opossum) observations at the Rancho de las Cabras National Historical Park.

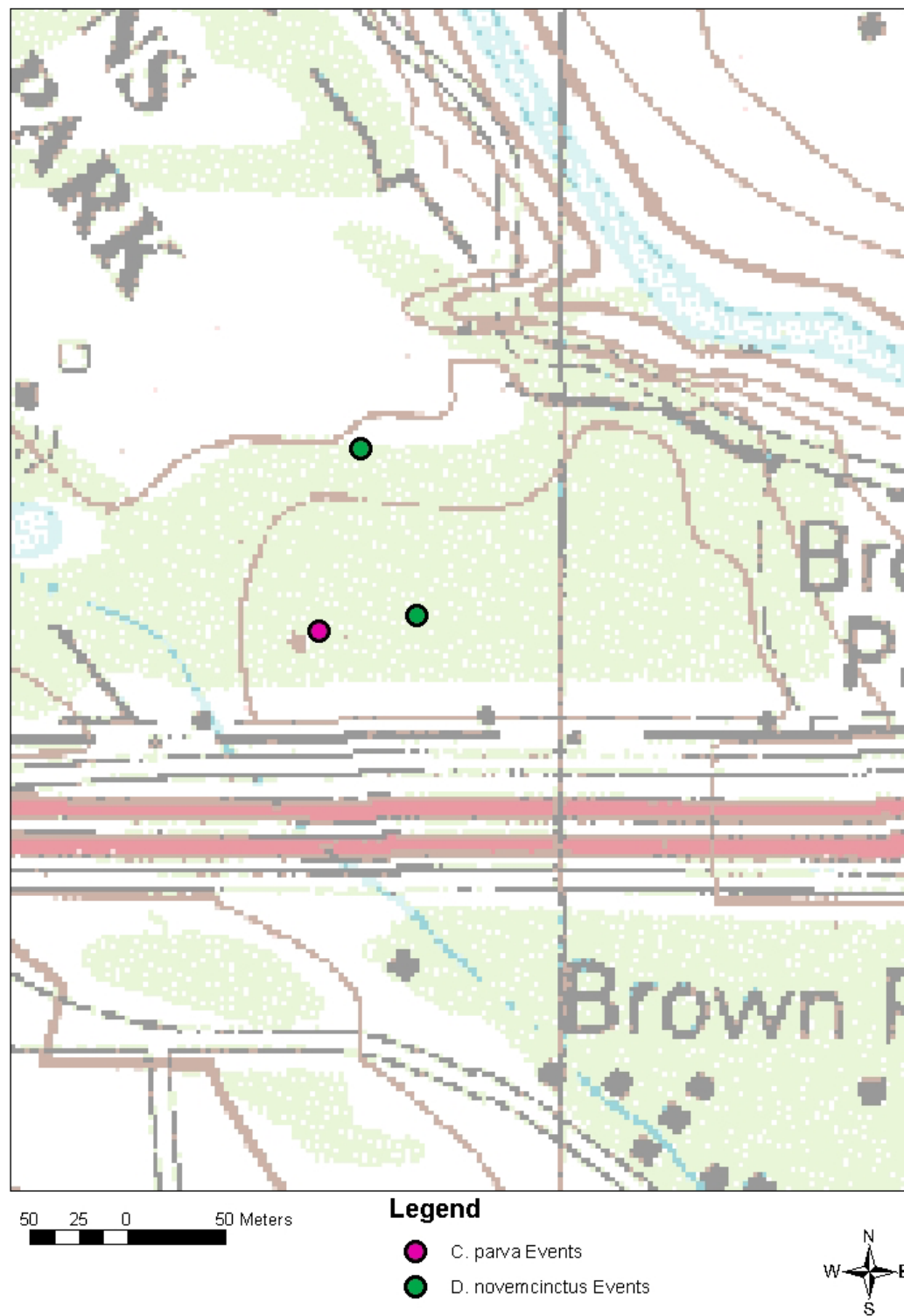


Figure 9. Location of *C. parva* (Least Shrew) and *D. novemcinctus* (Nine-banded Armadillo) observations at the San Antonio Missions National Historical Park.

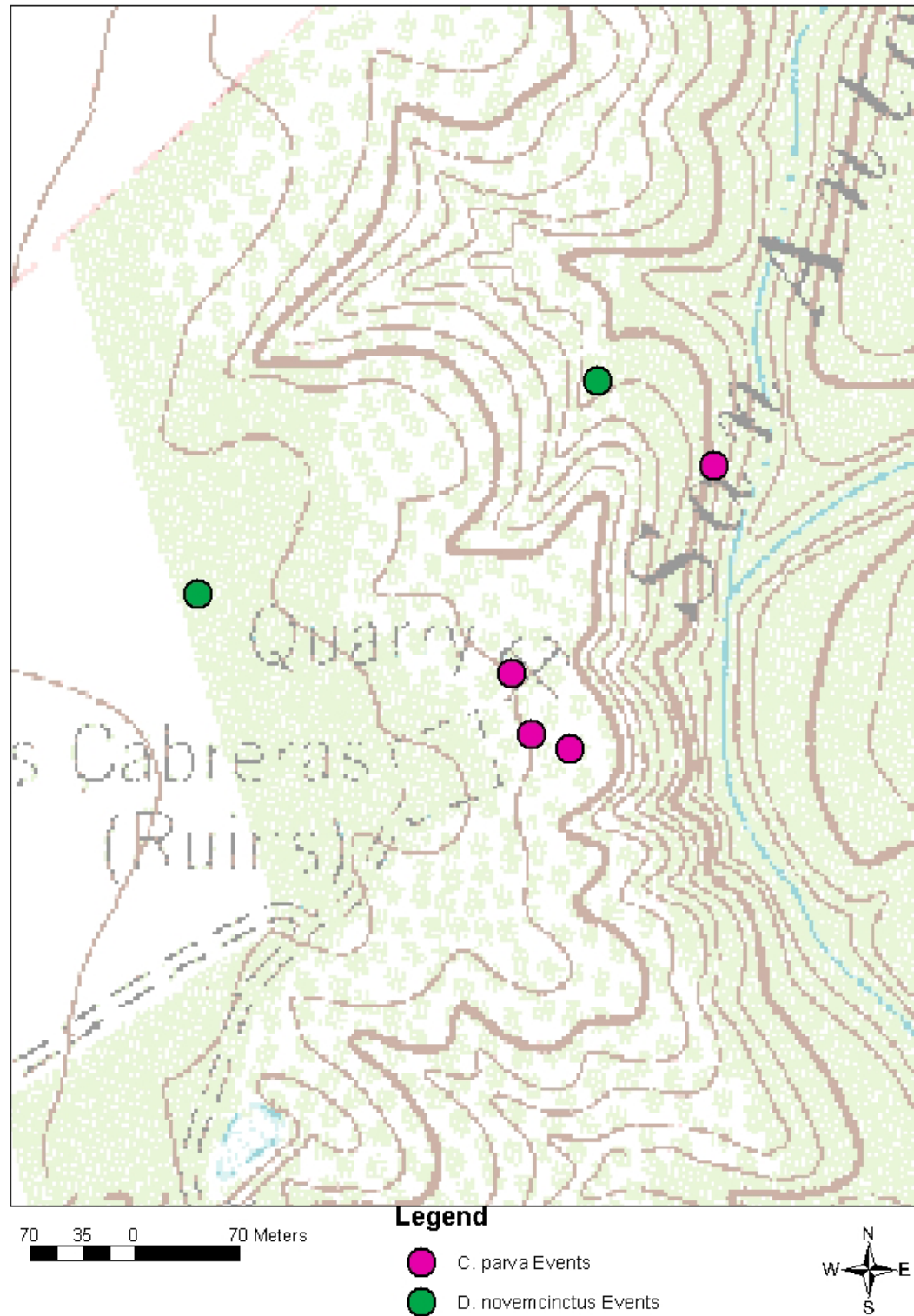


Figure 10. Location of *C. parva* (Least Shrew) and *D. novemcinctus* (nine-banded Armadillo) observations at the Rancho de las Cabras National Historical Park.

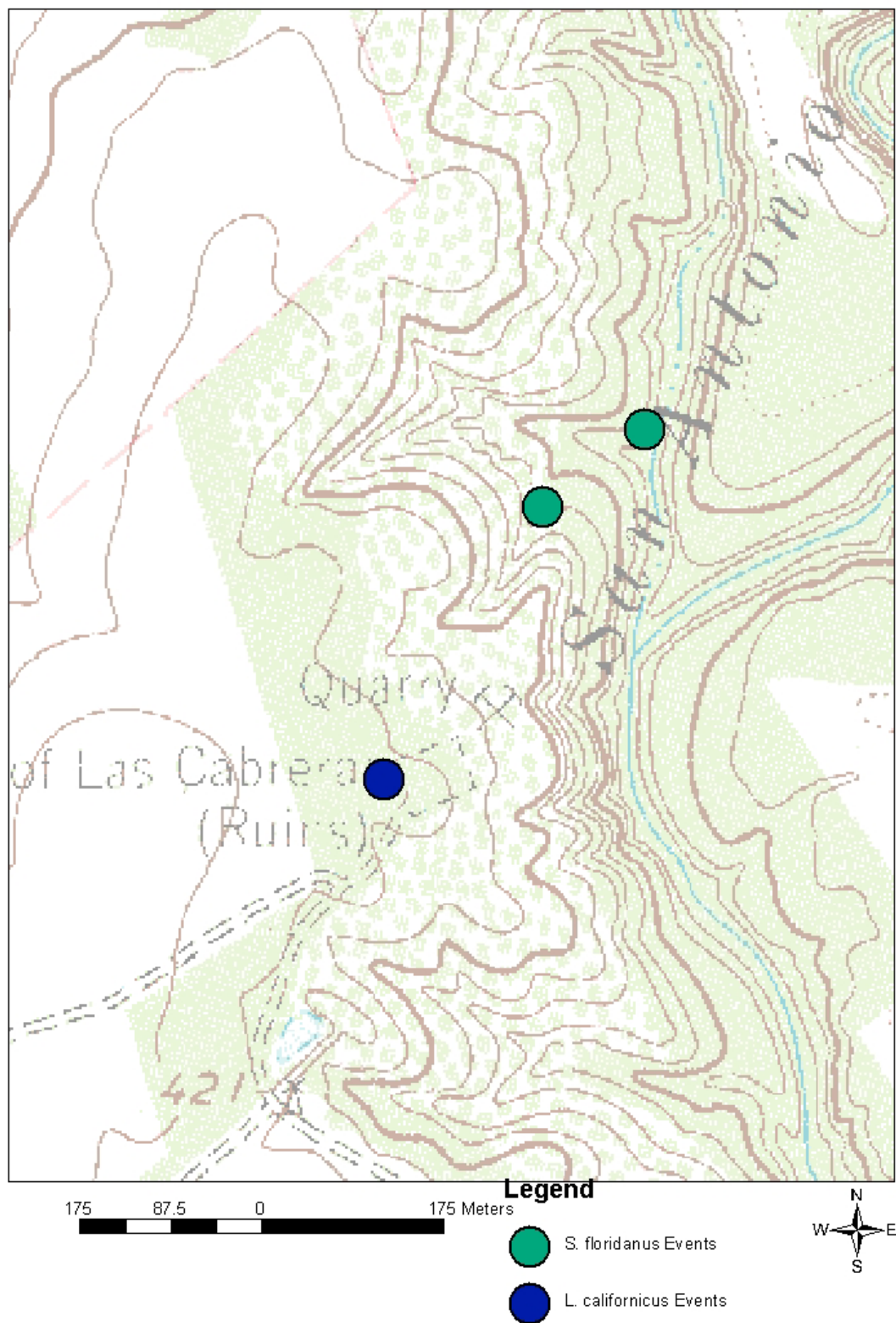


Figure 11. Location of *S. floridanus* (Eastern Cottontail) and *L. californicus* (Black-tailed Jackrabbit) observations at the Rancho de las Cabras National Historical Park.

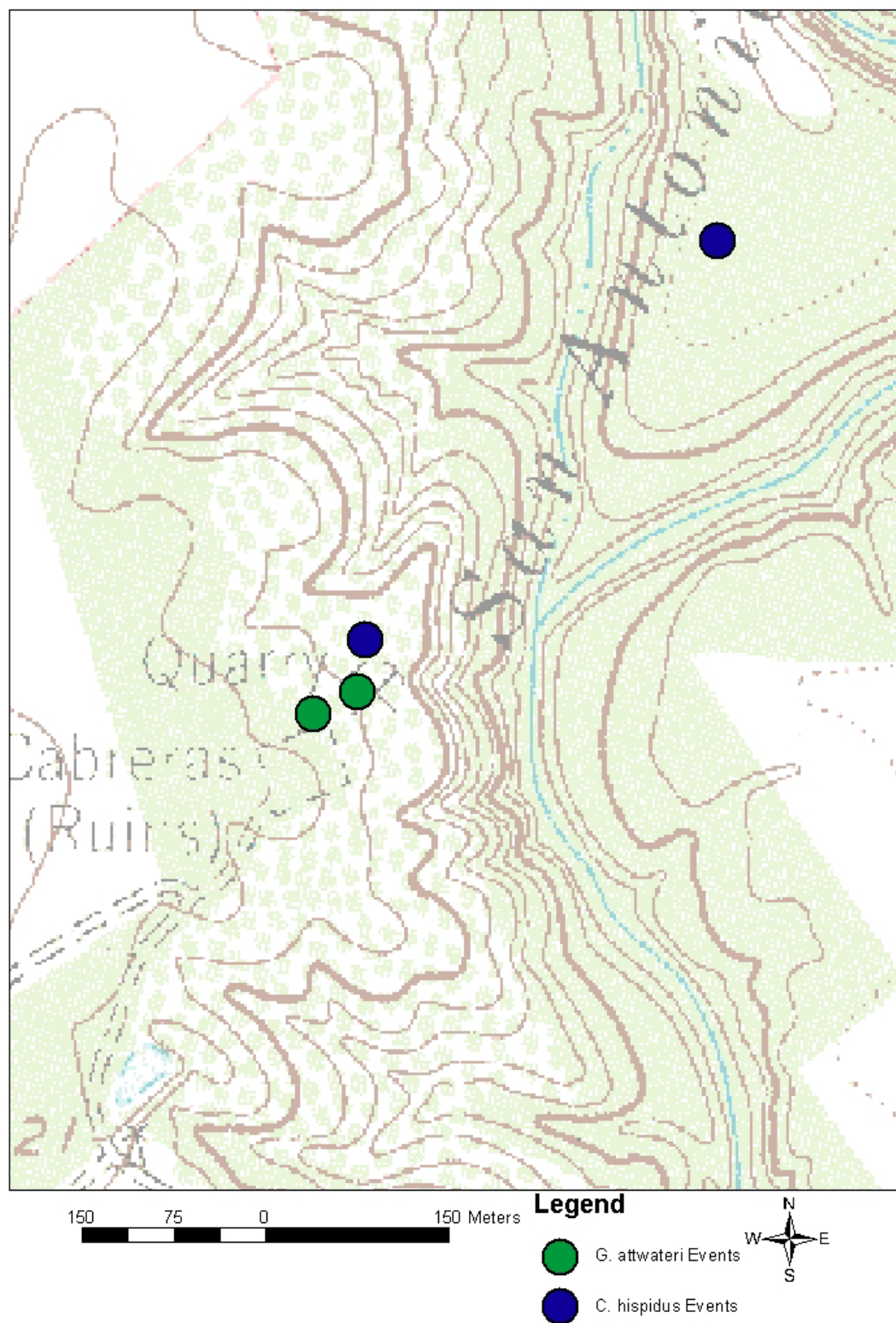


Figure 12. Location of *G. attwateri* (Attwater's Pocket Gopher) and *C. hispidus* (Hispid Pocket Mouse) observations at the Rancho de las Cabras National Historical Park.

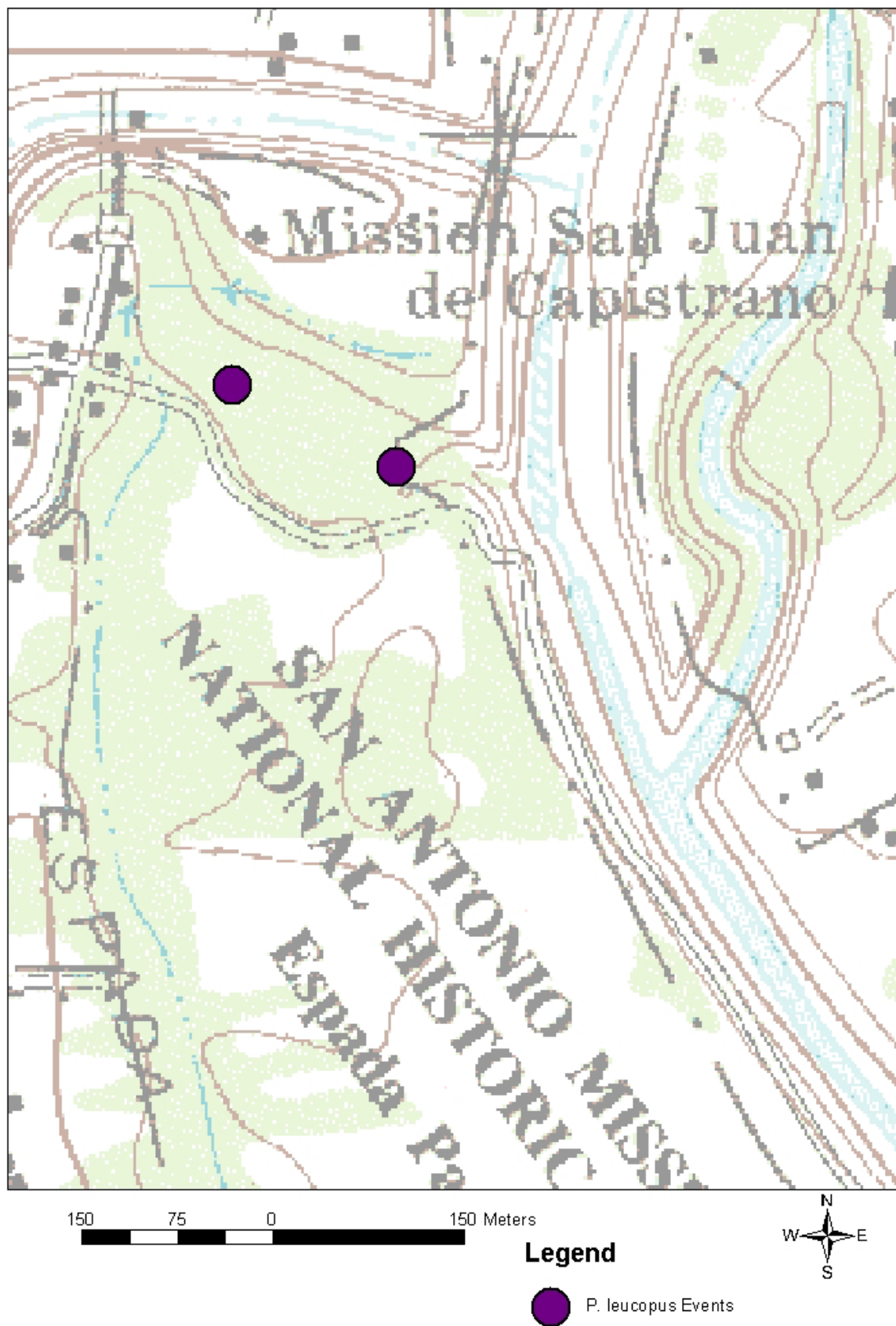


Figure 13. Location of *P. leucopus* (White-footed Mouse) observations at the San Antonio Missions National Historical Park.

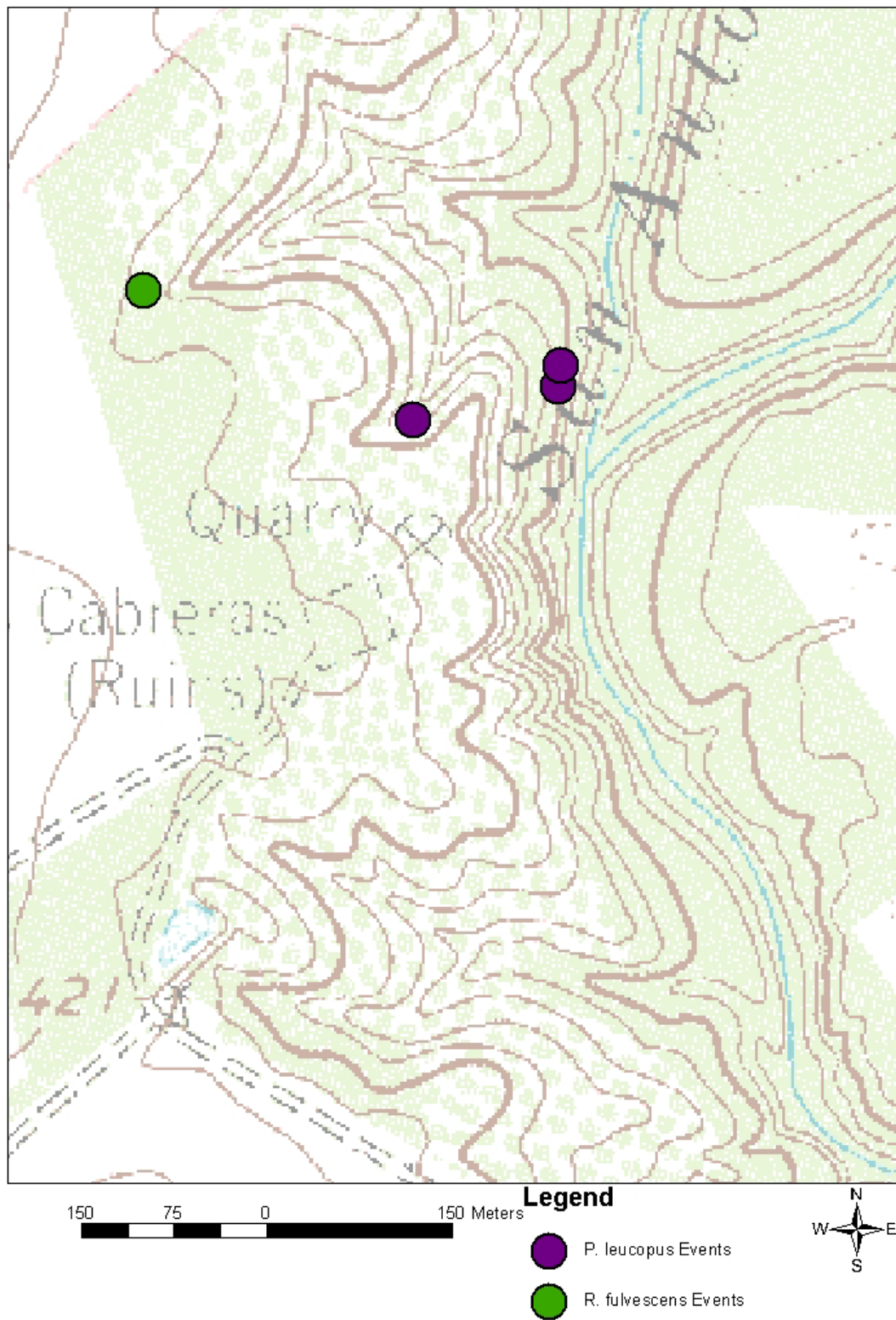


Figure 14. Location of *P. leucopus* (White-footed Mouse) and *R. fulvescens* (Fulvous Harvest mouse) observations at the Rancho de las Cabras National Historical Park.

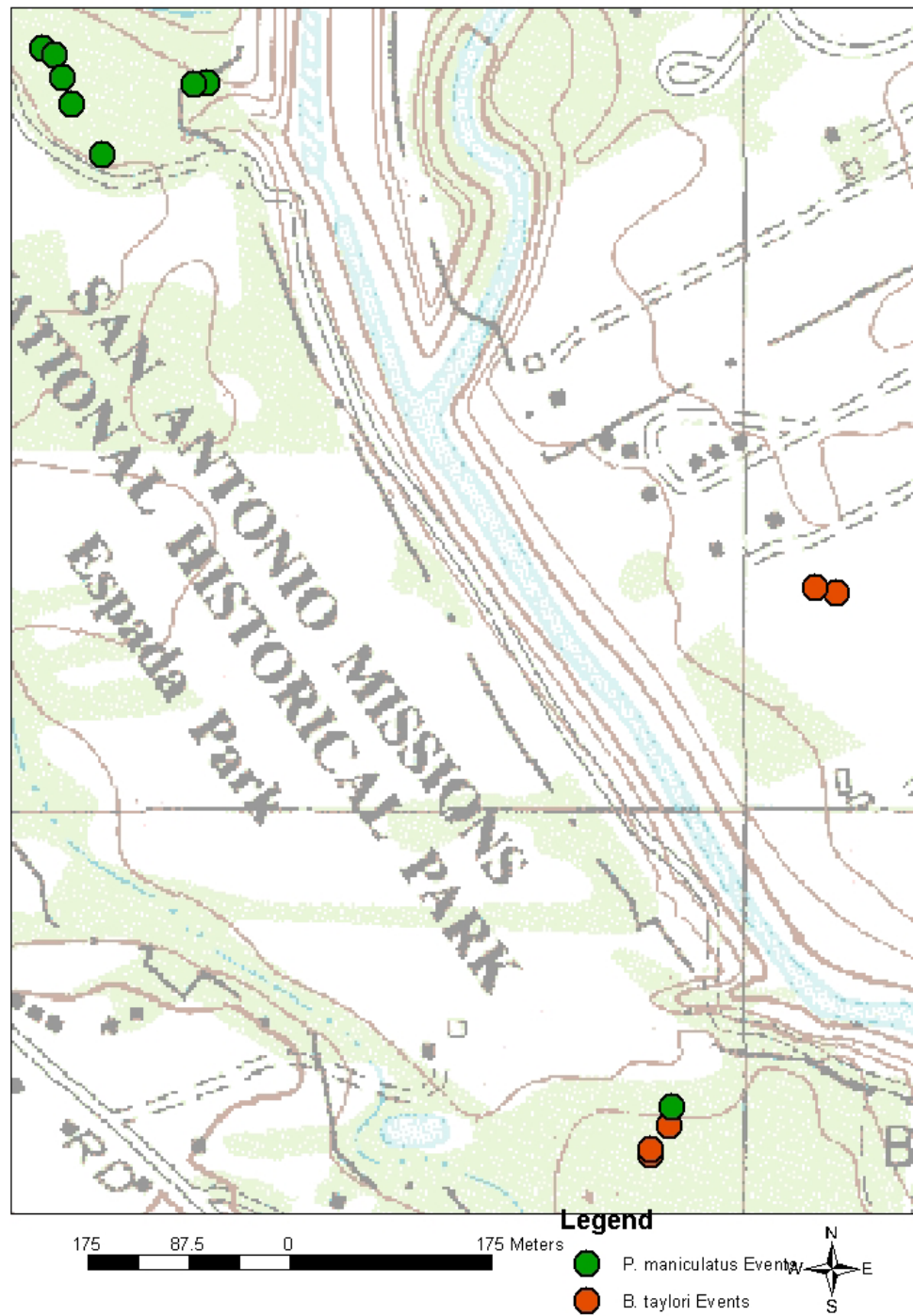


Figure 15. Location of *P. maniculatus* (Deer Mouse) and *B. taylori* (Pygmy Mouse) observations at the San Antonio Missions National Historical Park.

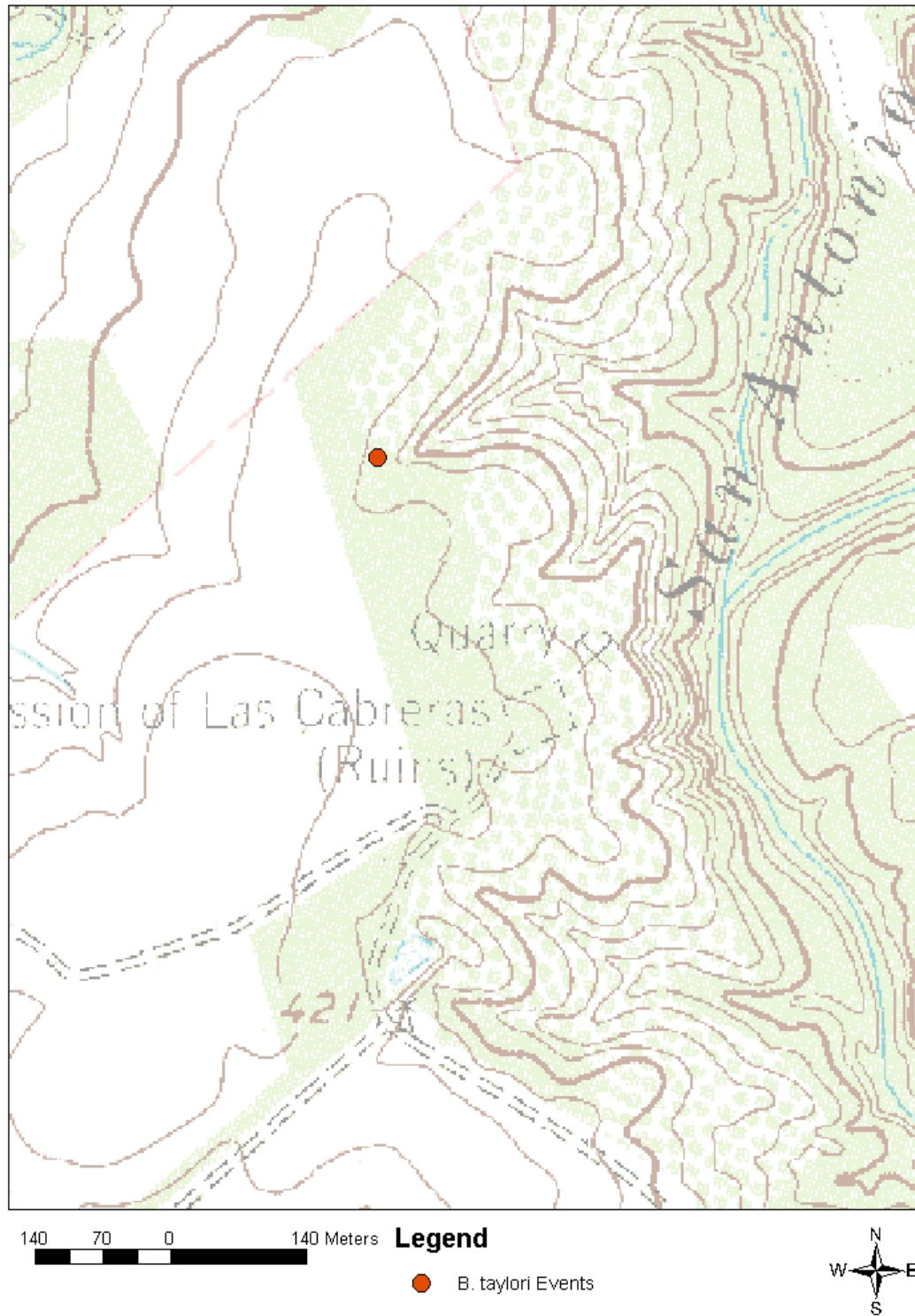


Figure 16. Location of *B. taylori* (Pygmy Mouse) observations at the Rancho de las Cabras National Historical Park.

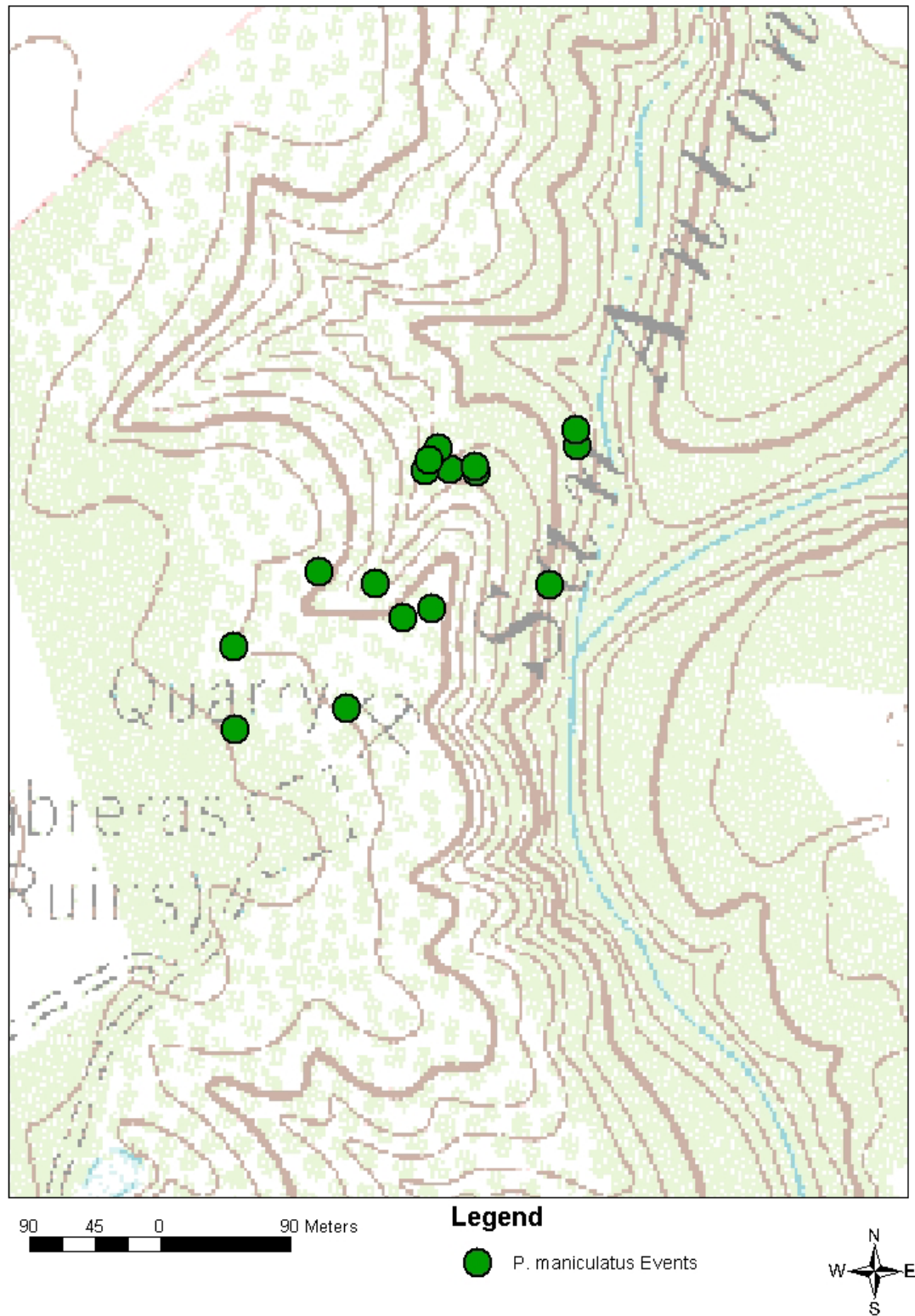


Figure 17. Location of *P. maniculatus* (Deer Mouse) observations at the Rancho de las Cabras National Historical Park.

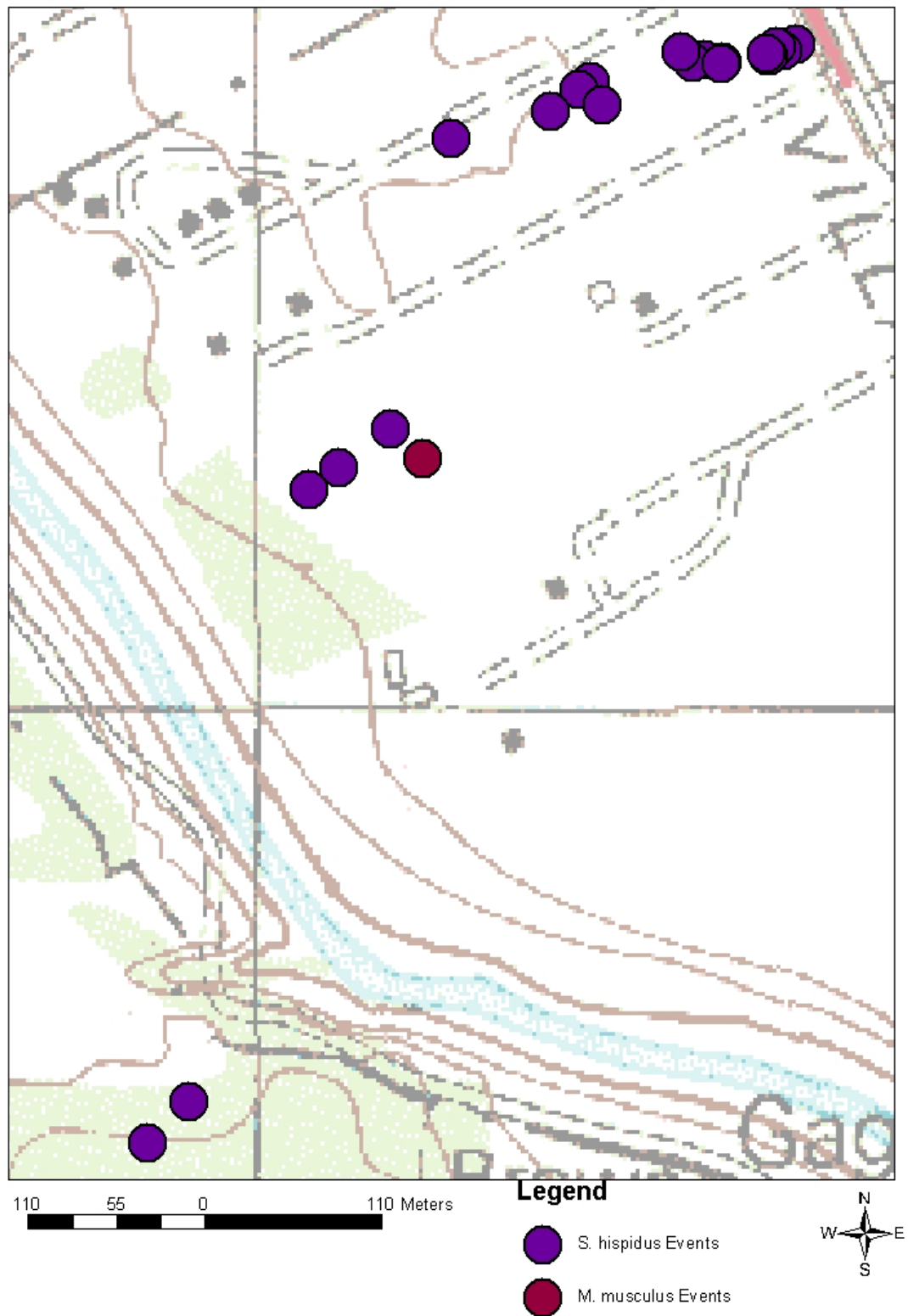


Figure 18. Location of *S. hispidus* (Hispid Cotton Rat) and *M. musculus* (House Mouse) observations at the San Antonio Missions National Historical Park.

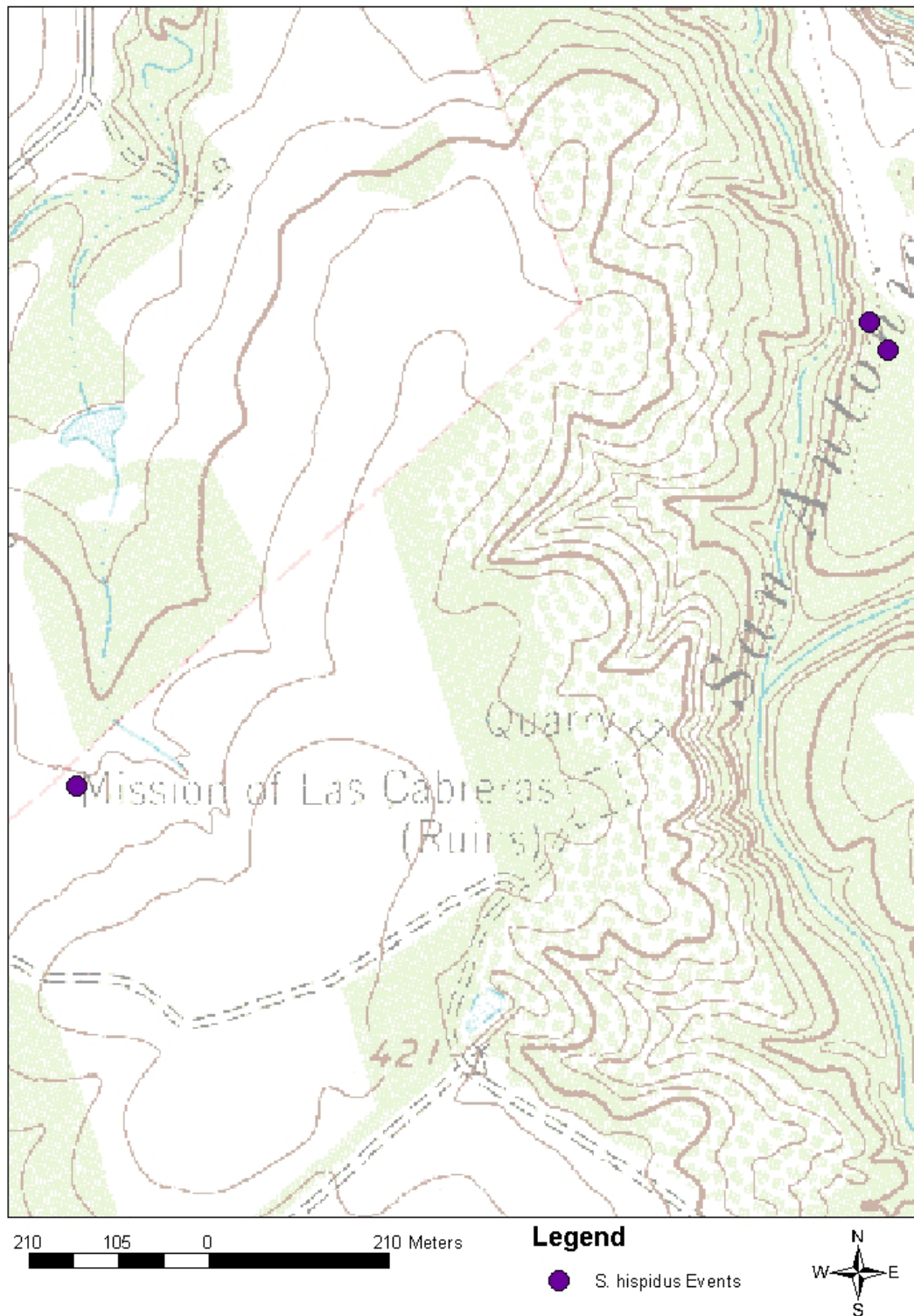


Figure 19. Location of *S. hispidus* (Hispid Cotton Rat) observations at the Rancho de las Cabras National Historical Park.

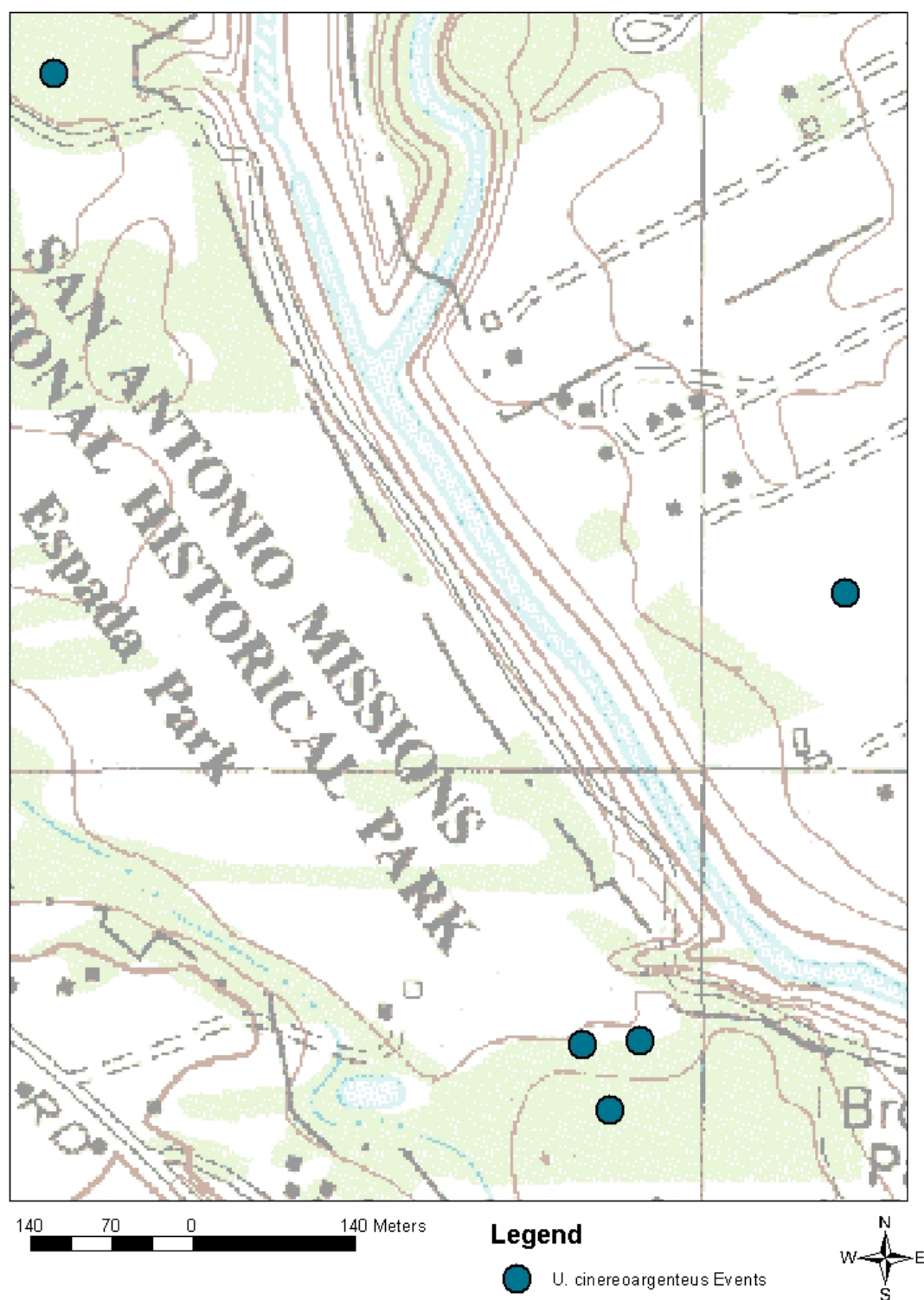


Figure 20. Location of *U. cinereoargenteus* (Gray Fox) observations at the San Antonio Missions National Historical Park.

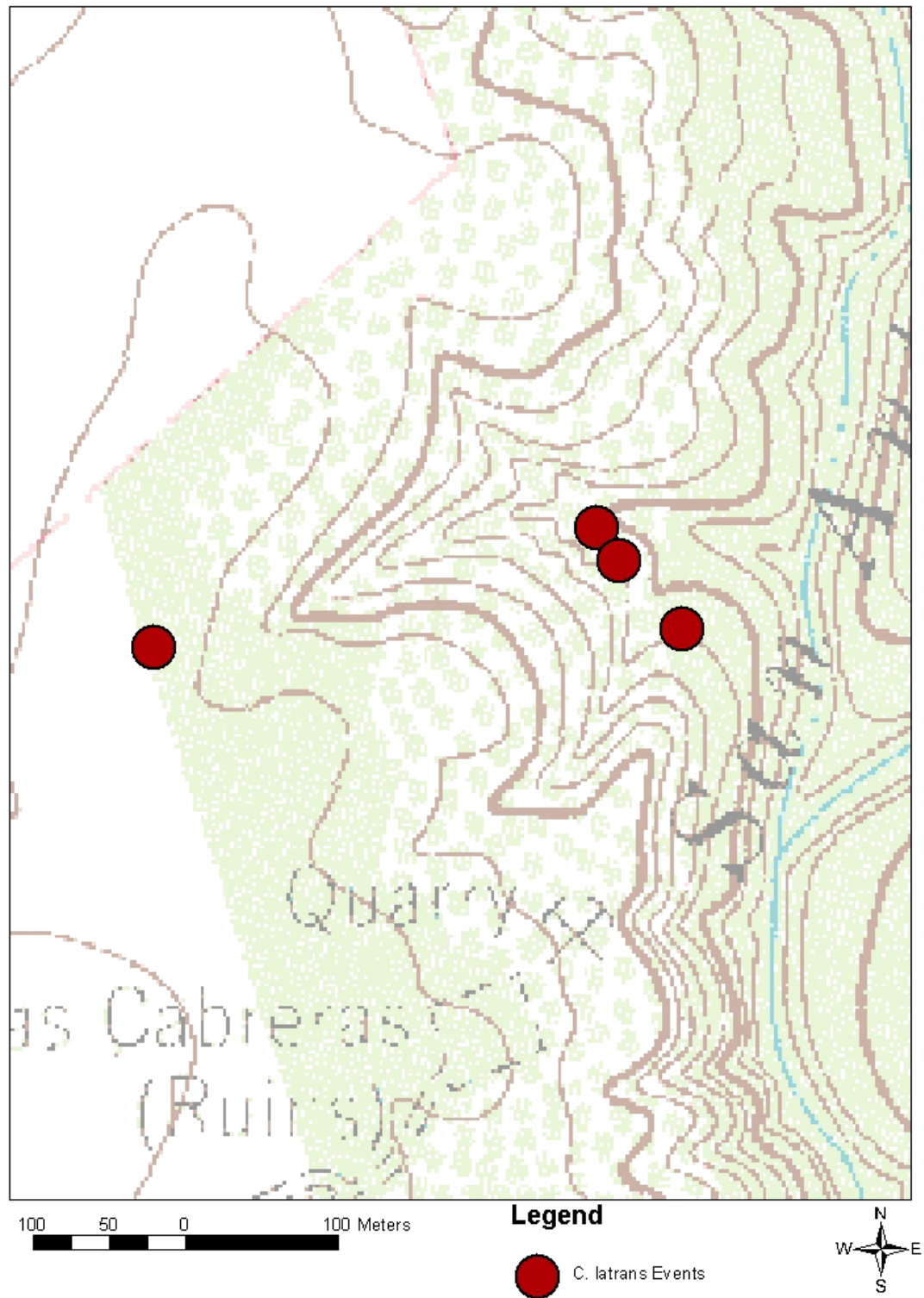


Figure 21. Location of *C. latrans* (Coyote) observations at the Rancho de las Cabras National Historical Park.

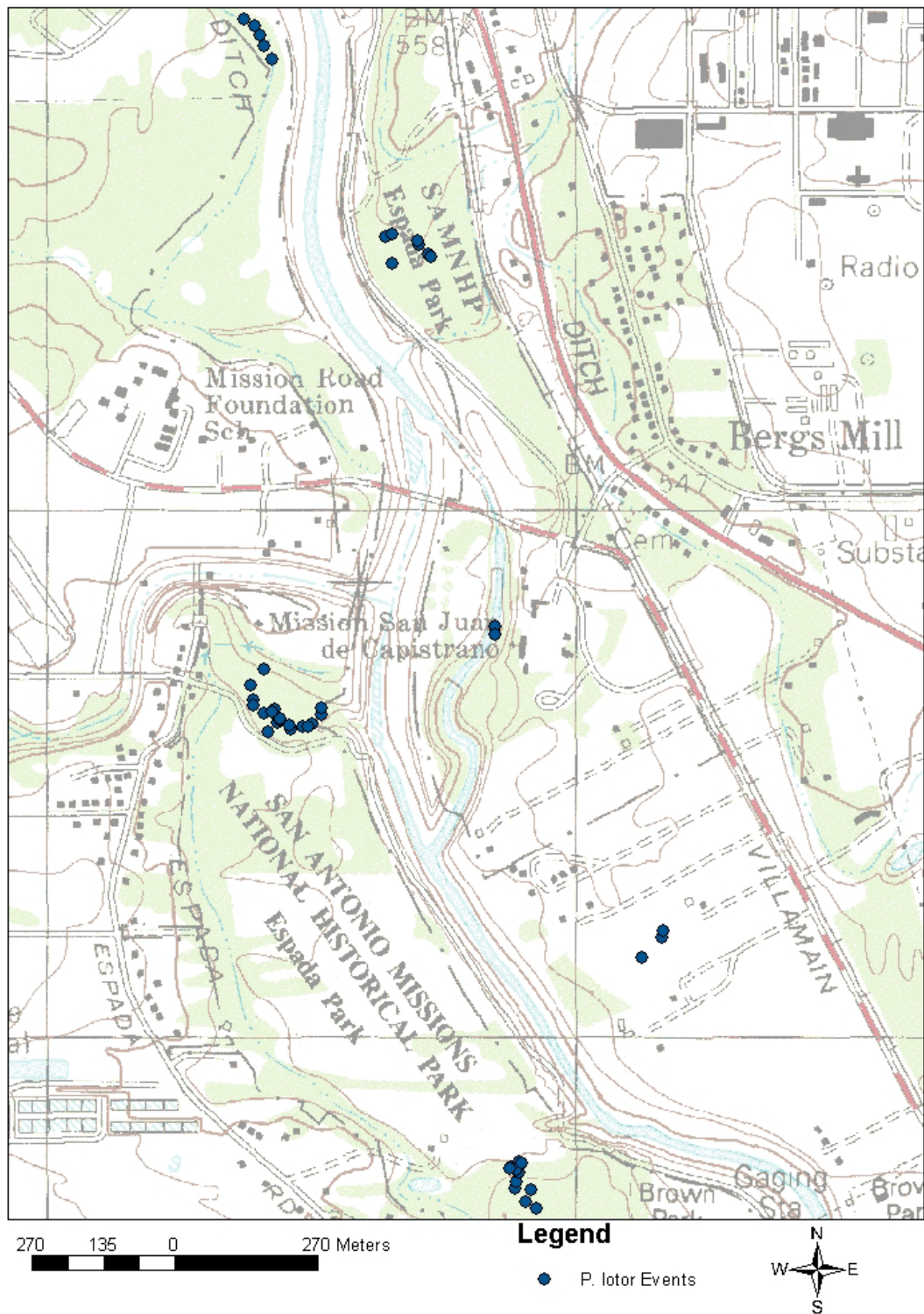


Figure 22. Location of *P. lotor* (Raccoon) observations at the San Antonio Missions National Historical Park.

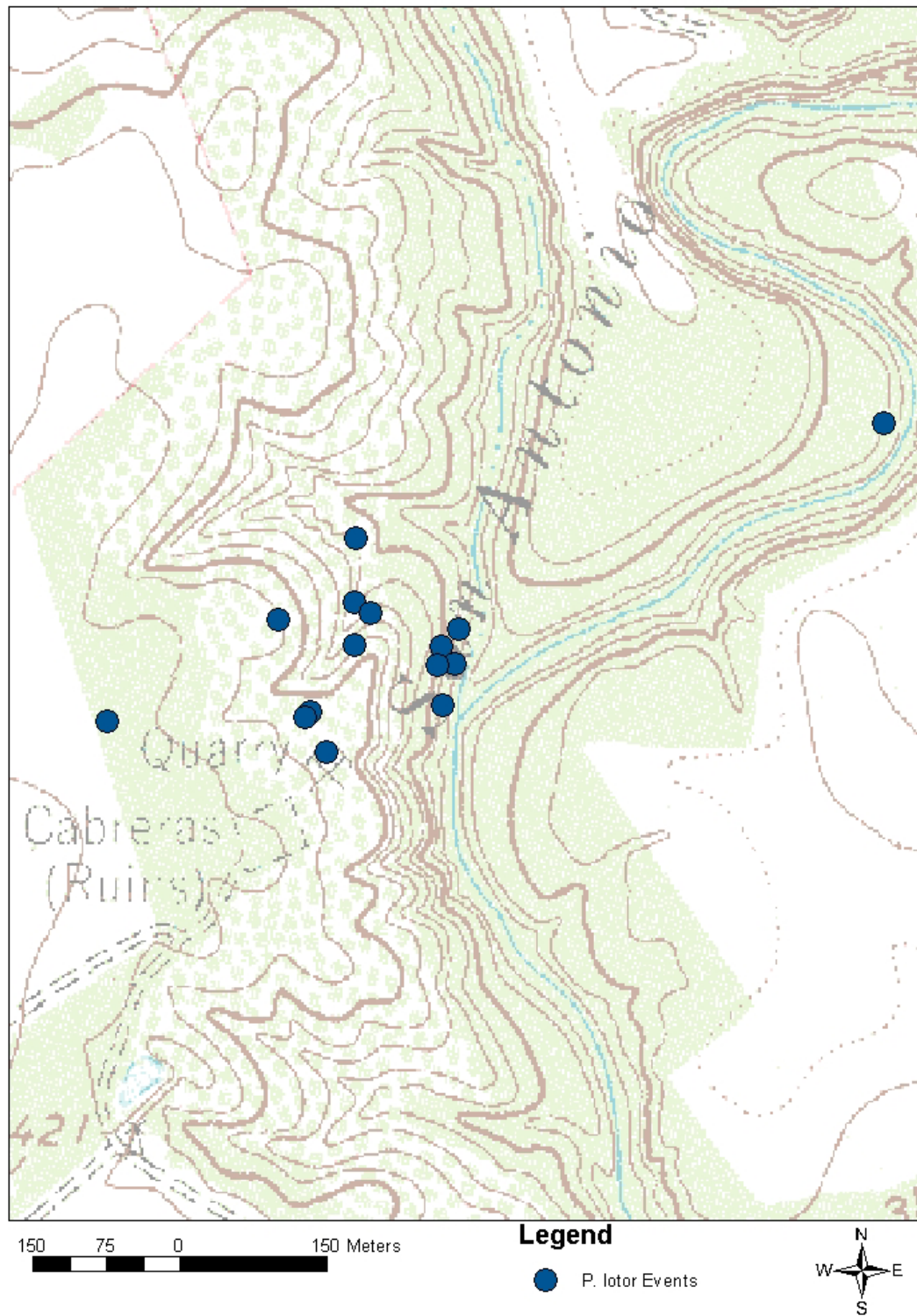


Figure 23. Location of *P. lotor* (Raccoon) observations at the Rancho de las Cabras National Historical Park.

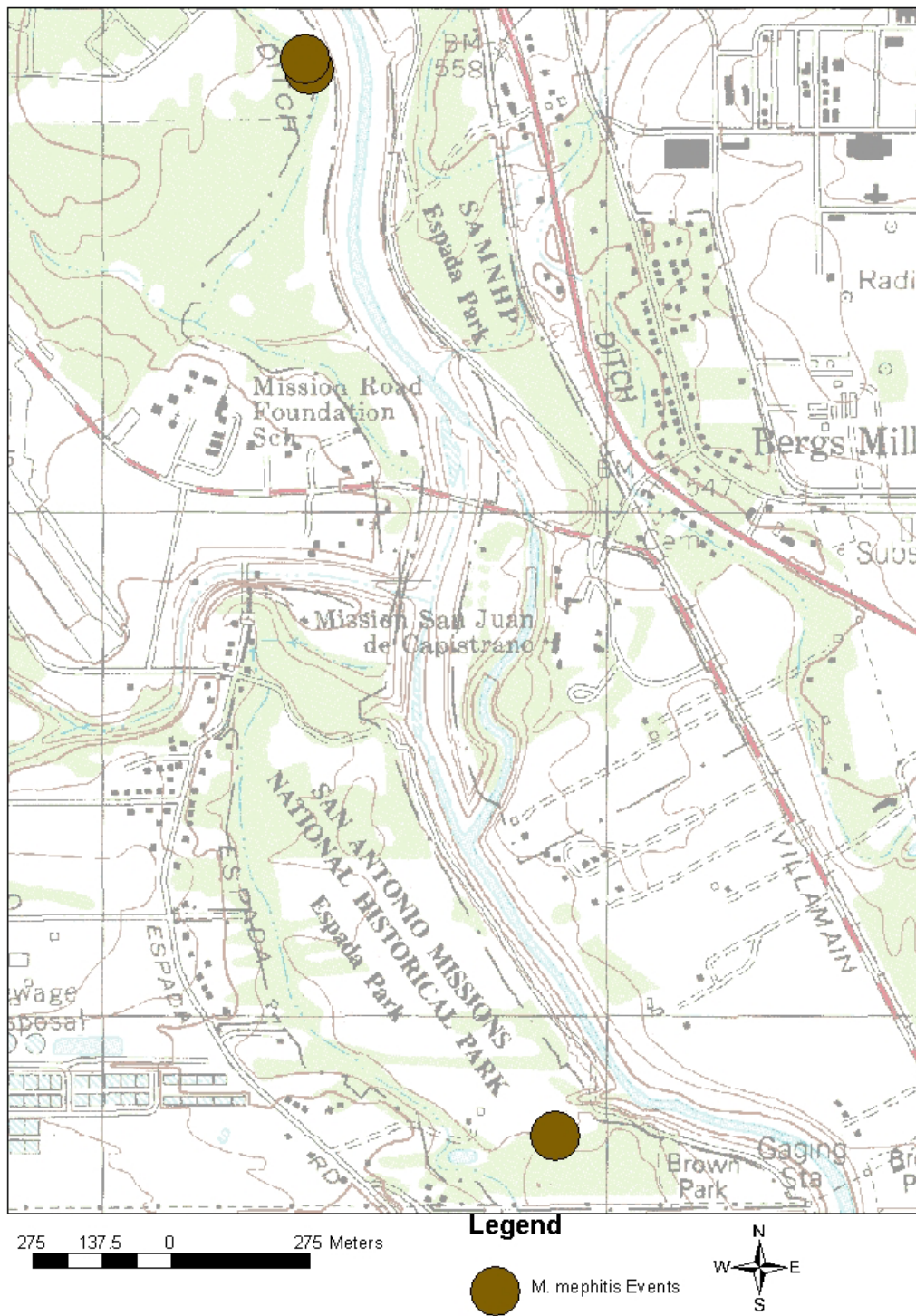


Figure 24. Location of *M. mephitis* (Striped Skunk) observations at the San Antonio Missions National Historical Park.

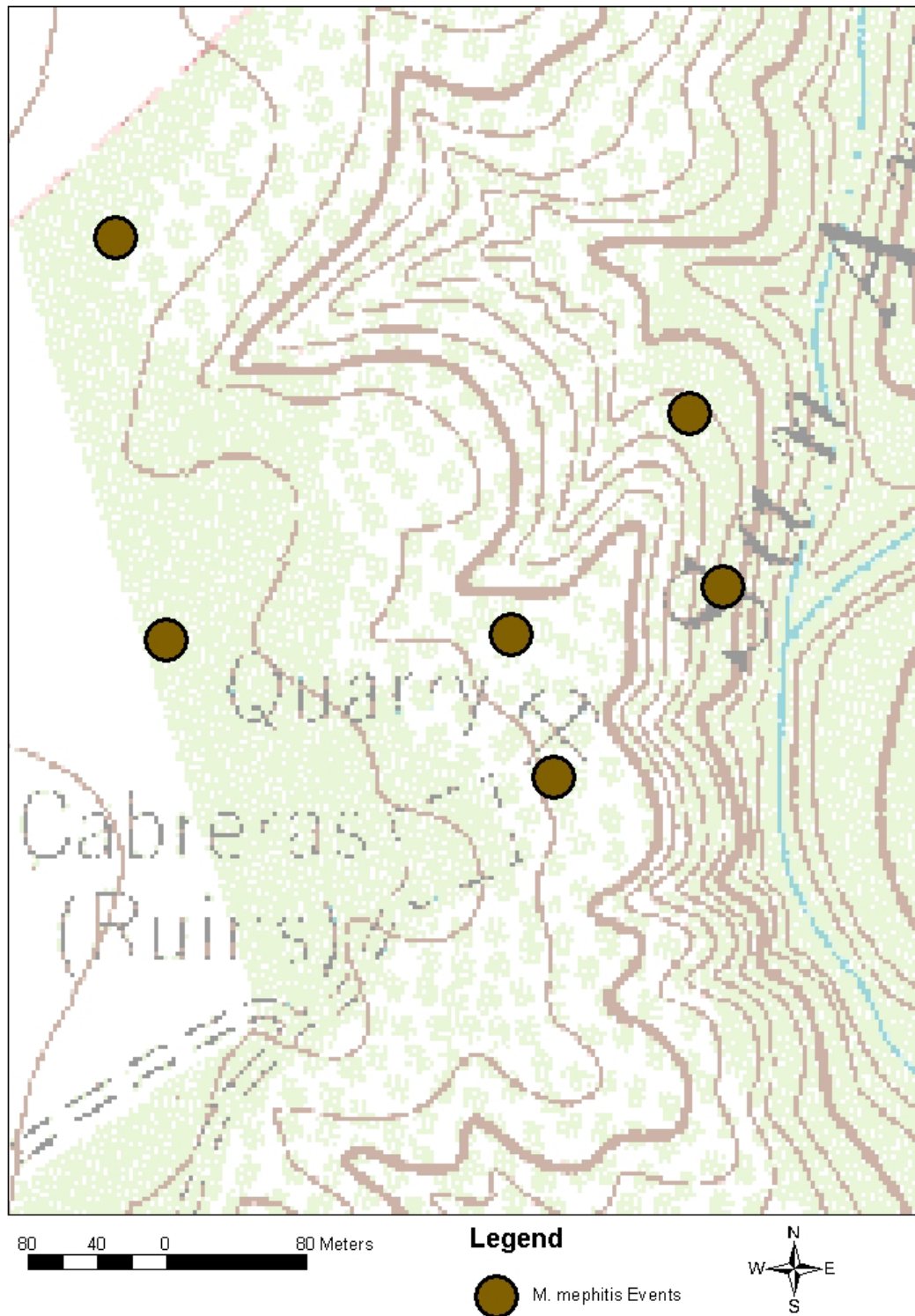


Figure 25. Location of *M. mephitis* (Striped Skunk) observations at the Rancho de las Cabras National Historical Park.

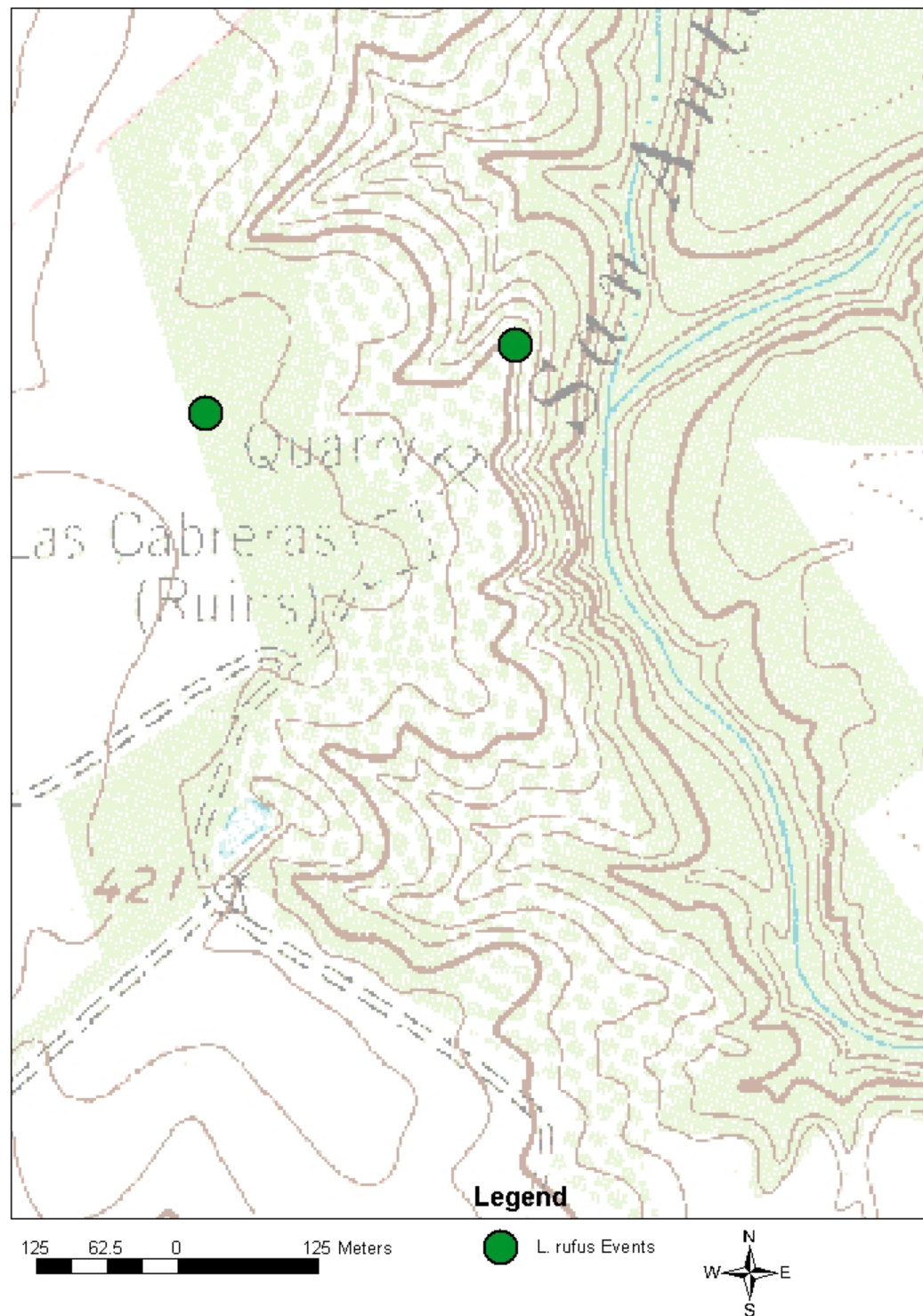


Figure 26. Location of *L. rufus* (Bobcat) observations at the Rancho de las Cabras National Historical Park.

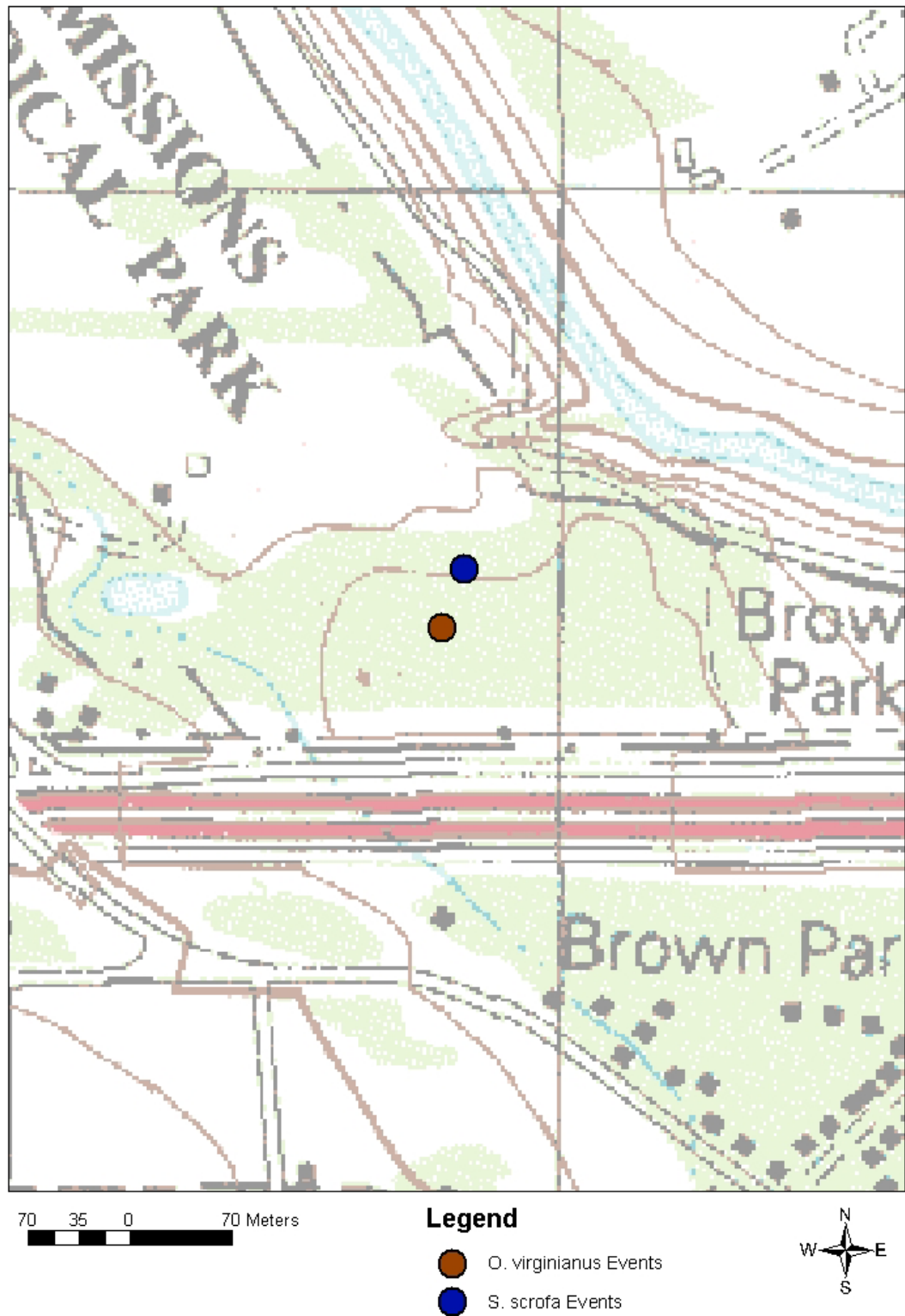


Figure 27. Location of *O. virginianus* (White-tailed Deer) and *S. scrofa* (Feral Pig) observations at the San Antonio Missions National Historical Park.

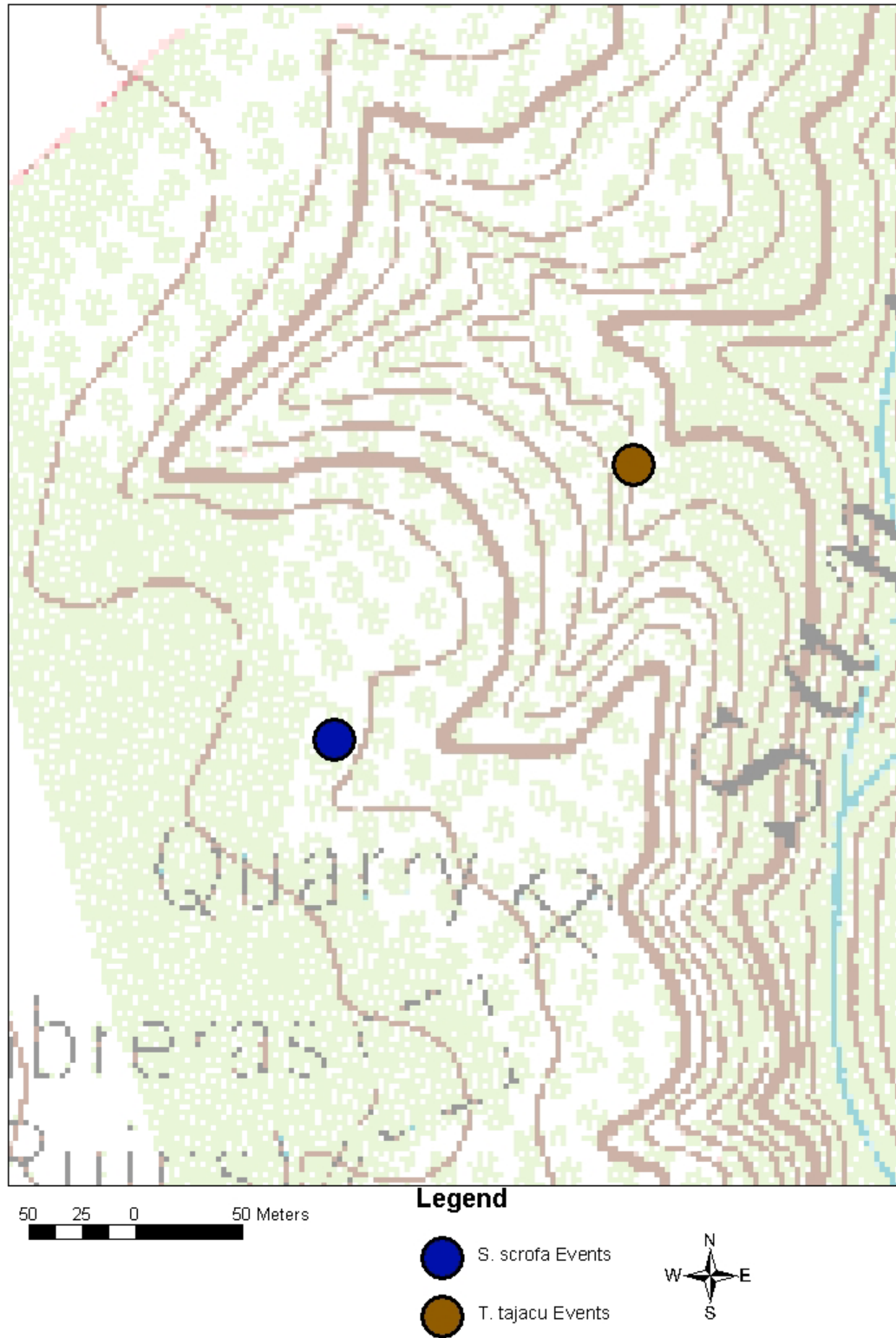


Figure 28. Location of *S. scrofa* (Feral Pig) and *T. tajacu* (Collared Peccary) observations at the Rancho de las Cabras National Historical Park.

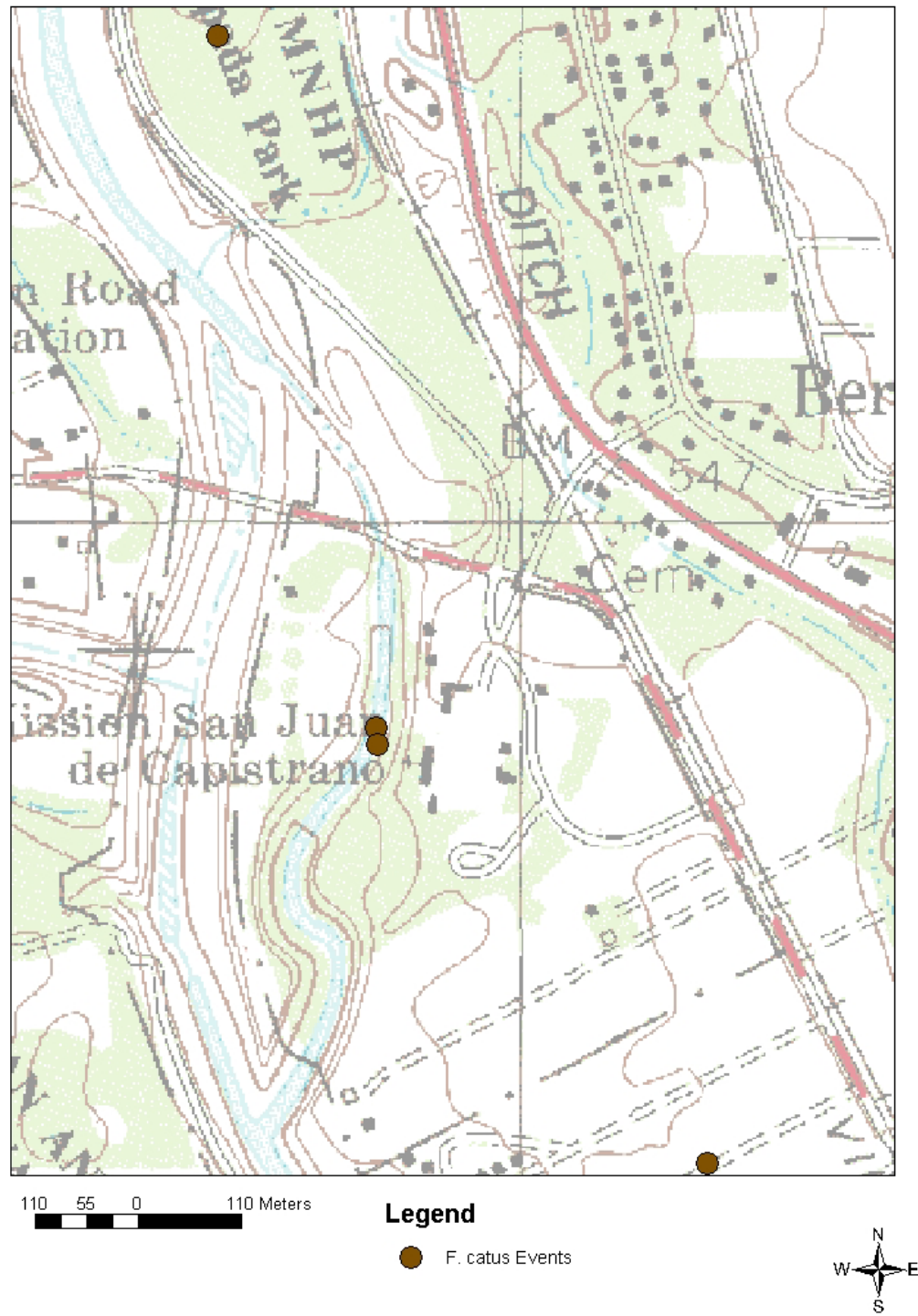


Figure 29. Locations of *Felis catus* (Domestic cat) observations at the Missions National Historical Park.

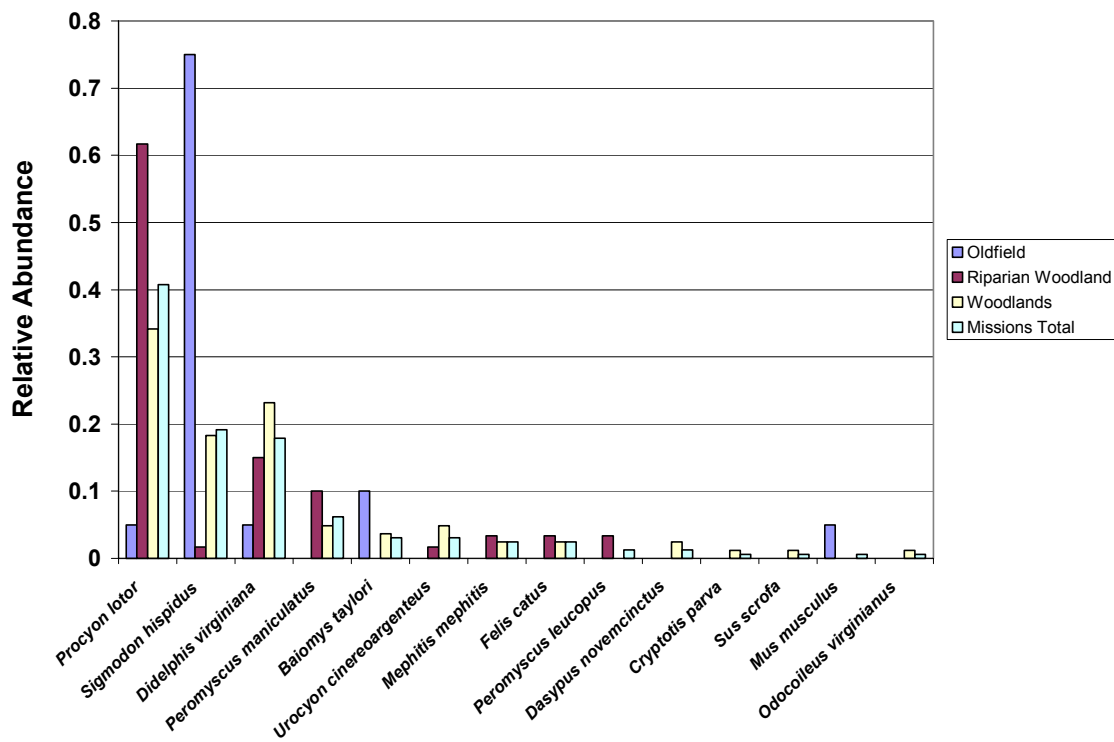


Figure 30. Relative abundance of mammal species found in three different habitats at the Missions unit of the San Antonio National Historical Park, San Antonio, Texas.

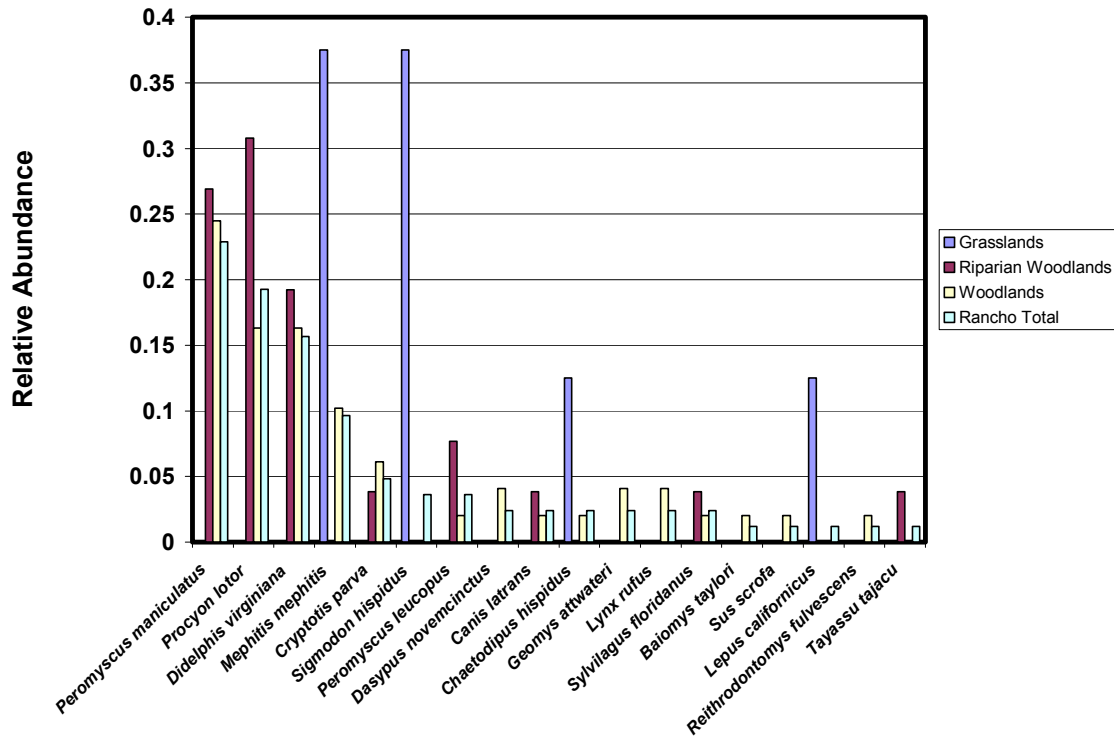


Figure 31. Relative abundance of mammal species found in three different habitats at the Rancho de las Cabras unit of the San Antonio National Historical Park, San Antonio, Texas.